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TIMBER MANAGEMENT ELEMENT

of the Santa Cruz County General Plan

Adopted by the Board of Supervisors April 22, 1986

COUNTY OF SANTA CRUZ
PLANNING DEPARTMENT



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TIMBER MANAGEMENT ELEMENT
OF SANTA CRUZ COUNTY
GENERAL PLAN

Adopted by the Board of Supervisors
April 22, 1986

Prepared by the Environmental Division of
the County Planning Department

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TABLE OF CONTENTS - Text


Chapter I - SETTING.....	1
Introduction.....	2
Environmental Setting.....	3
Socioeconomic Setting.....	6
Synopsis of a Timber Harvest Operation.....	7
Chapter II - THE FOREST ECOSYSTEM.....	9
Environmental Factors Affecting Timber Growth: Soils and Climate....	10
The Pacific Coast Conifer Forest.....	11
Historic Trends Within the Santa Cruz Forest.....	22
Chapter III - SILVICULTURE AND TIMBER YIELD.....	27
Redwood Silviculture in the Santa Cruz Mountains.....	28
Synthesis of Available Inventory Data.....	31
Future Scenarios of Productivity.....	42
Chapter IV - EXISTING REGULATORY FRAMEWORK.....	51
Timber Harvesting Regulations.....	52
Timberland Planning.....	62
Chapter V - TIMBER MANAGEMENT IN SANTA CRUZ COUNTY.....	69
Timberland Ownerships.....	70
Spectrum of Intensities of Timber Management.....	71
Timber Management Plans for Individual Ownerships.....	72
Available Government Assistance.....	75
Chapter VI - IMPACTS AND ISSUES.....	81
Water Quality.....	82
Visual Resources.....	90
Log Hauling.....	92
Forest Ecosystem.....	92
Sustained Yield.....	95
Cumulative Impacts.....	98
Timber Harvest Review Process.....	100
Development Activities.....	108
Chapter VII - CONCLUSION/RECOMMENDATION.....	121
Conclusion.....	121
Recommendations.....	123
Bibliography.....	129

TABLE OF CONTENTS - Tables

Table 1 - Three Santa Cruz County Conifers - Descriptions.....	16
Table 2 - Examples of Stand Structures Possible Under the Selection System.....	32
Table 3 - Area by Class and Ownership - Santa Cruz County.....	36
Table 4 - Forested Area in Acres by Forest Type and Drainage Basin.....	37
Table 5 - Forested Area in Percent by Forest Type and Drainage Basin.....	37
Table 6 - Average Tree Specifications.....	38
Table 7 - Volume, Net Annual Growth, and Growth Percent of Growing Stock and Sawtimber by Species.....	39
Table 8 - Area of Commercial Forest Land by Forest Type, Volume, Net Growth, and Percent of Growing Stock and Sawtimber by Forest Type.....	40
Table 9 - Volume of Hardwoods and Softwoods.....	41
Table 10 - Timber Harvest Permit Issuance - TPZ vs. Non-TPZ (1/79-6/82).....	110
Table 11 - Evaluation of Buildout on TPZ Parcels Under Various Land Use Policy Assumptions.....	116

TABLE OF CONTENTS - Figures

Figure 1 - Santa Cruz County Geography.....	5
Figure 2 - Pacific Coast Conifer Forest.....	12
Figure 3 - Trees Per Acre Per Age Class.....	30
Figure 4 - Volume Over Time.....	42
Figure 5 - Volume and PAG Compared.....	43
Figure 6 - Volume and MAG Compared.....	44
Figure 7 - PAG and MAG Compared.....	45
Figure 8 - PAG and MAG with Data Points.....	46
Figure 9 - Timing of State Review Process.....	58
Figure 10 - Highest Densities Allowed on TPZ Land.....	112
Figure 11 - Land Divisions and Timber Harvest Conflicts.....	113



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PREFACE

In June of 1981 the County Board of Supervisors, based upon concerns regarding the management of timberlands throughout Santa Cruz County, authorized funding for a one-year study culminating with the preparation of a County Timber Management Plan. That document evaluated then-current County policies which regulated both timber management and harvest practices.

In October of 1982, during review of the Timber Management Plan by the Planning Commission and Board of Supervisors, the Governor signed Senate Bill 856 which removed the County's authority to regulate timber harvest practices. That Bill however, did allow local counties to propose special regulations to the Board of Forestry for adoption as special county rules to be enforced by the California Department of Forestry.

Further review of the Timber Management Plan was deferred at that time to enable the Board of Supervisors and staff to focus attention to the special rules process. Since that time two separate rules packages have been submitted to the Board of Forestry.

Over the past several months staff has revised and updated the Timber Management Plan to reflect changes brought on by SB 856 along with a number of state and local activities. As well, we have attempted to address a number of the concerns raised regarding the earlier draft of this document.

Lastly, the name of the plan has changed to reflect both a confusion which arose regarding the contents of a "timber management plan" and to recognize the value of the document as a policy statement of the County - thus its suggested status as an Element of the County General Plan.

CHAPTER 1

SETTING

From the beginning of Santa Cruz County's involvement with timber harvest and timber management activities it has been the policy of Santa Cruz County to encourage greater forest land production while maintaining a high level of environmental protection. This delicate balance of policy directives created the need for a careful analysis of the issues relating to protection of the environment and utilization of the forest resources. Over the last few years an attempt has been made to study various aspects of those issues. That previous work has been combined with additional research over the past several years culminating in this document - The Timber Management Element of the Santa Cruz County General Plan.

This Chapter presents a brief background and history of the development of the Timber Management Element and presents the overall format of the document. It also presents the setting, both environmentally and socioeconomically, within which all of the various issues discussed within must be considered. Lastly, it presents a brief synopsis of the various stages involved in the development, execution, and completion of a harvest operation.

INTRODUCTION

Timber production has played an important long-term role in the history of Santa Cruz County. From the Civil War to World War I timber production dominated the County's economy.

From the inception of County involvement in the regulation of timber harvest activities it has been County policy to allow for continued production from the County timberlands while assuring that harvest activities do not significantly degrade the local environment. This policy recognizes the economic and other advantages of developing and maintaining a resource-based industry which maintains substantial portions of the County in open space uses. The policy has been best stated in the County's Timber Harvesting Ordinance:

It is the policy of the Board of Supervisors to encourage the continued production of forest products in compliance with performance standards which emphasize protection of environmental and open space values while fostering increased productivity of forest land, and to protect, maintain and improve the forest land of Santa Cruz County.

County Ordinance 2353

With the adoption of the Forest Taxation Reform Act in 1976, it became the County's role to assure protection of land suitable for timber production from other land uses which could significantly reduce the productive capability of that land. At that time, the County established a special zone district "...to protect and maintain the timberland of the County through regulation of timberland use..." (County Ordinance 2520).

In order to achieve these policy objectives, it has been necessary for the County to undertake a long-term study of timberland, timber stand growth, harvest techniques, and associated effects. These concerns became the backbone for what has become the County Timberland Management Element of the County General Plan.

Plan History

Through use of special state grant funds the County was able to undertake an inventory of its timberland. Dr. Norman Pillsbury was contracted to prepare this analysis, which was released in 1979.

At that time there was considerable concern that the County was allowing overcutting of local timberlands. In response to those concerns, the County Forester prepared a brief report which, based upon the Pillsbury data, concluded that overcutting was not occurring.

That report fell far short of what was required to answer some of the basic questions raised by the County's own policy statement regarding timber management and production - namely, what is the extent of our timber resource, how should it best be utilized, and what are the consequences of various intensities of harvesting and harvest techniques?

In June 1981, the County Board of Supervisors allocated one year's staff time to complete the study and to answer these basic questions. The result of that year of research and analysis along with a major revision to the analysis is contained within this document.

Document Format

The Timber Management Element is structured to present the reader with background information on the Santa Cruz Mountains environment (Chapter I); a general understanding of the timber species and vegetation communities encountered in the Santa Cruz Mountains (Chapter II); a detailed discussion of local silvicultural practices, existing timber growth, and general management possibilities (Chapter III); an overview of the variety of existing government regulations affecting timber management and production (Chapter IV); a presentation of timberland management in Santa Cruz and possible methods for implementation (Chapter V); an analysis of the issues involved in timber management and harvesting, relevant policy recommendations, and recommended follow-up studies (Chapter VII).

The document is organized in a fashion which requires the reader to follow the chapters in the order in which they are presented. Each chapter assumes knowledge of information discussed in earlier chapters.

ENVIRONMENTAL SETTING

Geography

The Santa Cruz Mountains, which lie within Santa Cruz, Santa Clara, San Francisco, and San Mateo Counties, are part of the Coast Range Complex, a mountain range which is young in age and rugged in character. Elevation range is from sea level to 3,000 feet. Slopes are moderate to extremely steep.

Within Santa Cruz County the mountains can be divided into four general areas, dictated by drainage basins (see figure 1). The North Coast is comprised of several moderate-sized watersheds which have formed on the west side of Ben Lomond Mountain. The San Lorenzo Valley is mainly the watershed for the San Lorenzo River, the largest watershed in the Santa Cruz Mountains, the width stretching from the backside of Ben Lomond Mountain to Highway 17, and the length extending to the summit of the Santa Cruz Mountains to the sea, encompassing a total of 138 square miles. The Soquel-Aptos Area includes the lands to the east of Highway 17 as far as Nisene Marks State Park, from the summit to the sea. The Pajaro area includes the remaining portion of the Santa Cruz Mountains, from Nisene Marks to the Pajaro River.

Geology

The geology of the Santa Cruz Mountains is complex, but can be typified as a core consisting of a huge uplifted granitic mass, overlain with a series of primarily marine sediments. As the granitic mass rose through many eons of geologic uplift, sediment deposition varied in character and thickness. Over time the mountains rose above sea level and became subject to climatic forces. Due to their relatively young age (a few million years old) they are actively undergoing alteration as nature attempts to restore equilibrium. This alteration takes the form of soil development, erosion, mass movement (landsliding), and the formation of new drainageways for surface water runoff.

The presence of several active fault zones running through the mountains also increases their instability and hinders attaining equilibrium through fracturing of rock materials, alteration of subsurface water damage, and occasional intense ground shaking.

Climate

The Santa Cruz Mountains' climate is moderated by its close proximity to the Pacific Ocean. Summers are hot and dry, but are frequently cooled by fog in the lower elevations. Cool winters are dampened by frequent, but unequally distributed rainfall, with the City of Santa Cruz averaging 30 inches annually while Boulder Creek receives double this in annual precipitation. Climate is discussed in more detail in Chapter II.

Vegetation and Wildlife

The unique combination of climatic and geologic factors dictates the presence of a complex variety of vegetation communities in the County's mountainous areas. Conifer and mixed evergreen vegetation types cover approximately

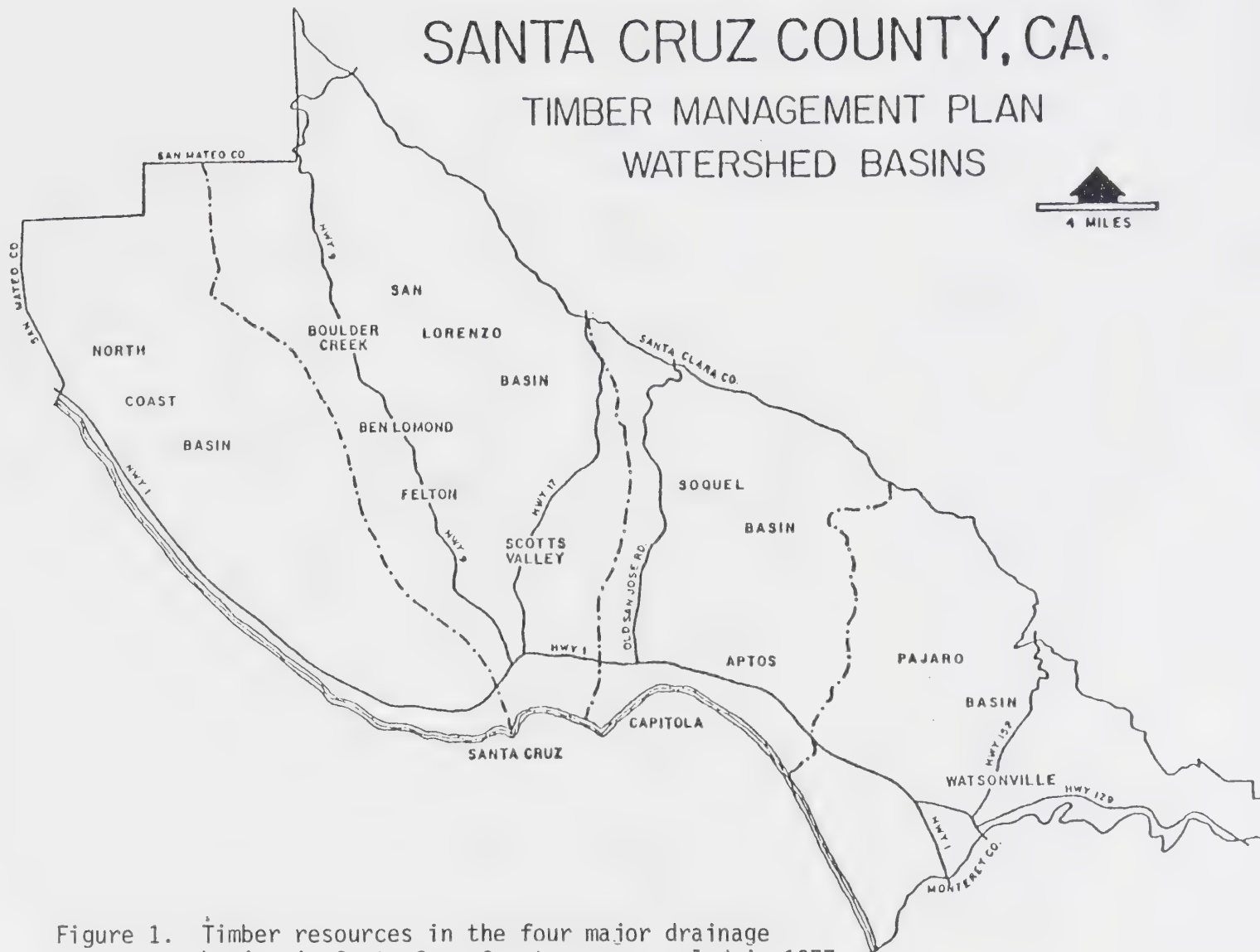


Figure 1. Timber resources in the four major drainage basins in Santa Cruz County were sampled in 1977.

152,000 acres of the County. (This vegetation type is discussed at length in Chapter II). In addition to this predominant vegetation, wide variation of vegetation takes place from the streamside areas (riparian vegetation) to the ridge tops (grass and brushlands). Significant overlapping of species types is quite common. Of the twenty-nine plant communities recognized in California (Munz and Keck, 1959) ten are found in the Santa Cruz Mountains. (Thomas 1961)

As vegetation varies, the opportunity for wildlife habitats varies accordingly. Although covering the largest area, the conifer and mixed evergreen forests are not the best habitat for wildlife. While they tend to be reasonably good range area for wildlife, the riparian areas are by far the most valuable area for wildlife due to the diversity of plant species, the nutrient-rich floodborne sediments, and year round available water.

SOCIOECONOMIC SETTING

Although Santa Cruz County is the smallest county in the State, geographically, it has historically been growing at one of the fastest rates. Although a large proportion of the growth now occurring has been directed into well-established urbanized areas, such practice has not always been the case. The mountains have long been considered a desirable place to live. The 1980 census figures support this by indicating that approximately 33 of the County's population lives within the mountain areas. These figures have been aggregated into the four areas mentioned previously, and are compared in terms of acres of forest land and people per acre:

	North Coast	San Lorenzo Valley	Soquel- Aptos	Pajaro
Population	6,000	24,000	11,500	6,000*
Forested Area (acres)	41,000	67,000	28,000	16,000
Pop. Density (people/acre)	0.15	0.36	0.41	0.38

* best estimate based upon available data

The North Coast is clearly a low density area resulting in relatively little conflict between populated areas and possible timber production. But, as will be discussed later, it is the source of a significant proportion of the urbanized County's water supply.

The figure for population density (persons per acre of forest land) for the San Lorenzo Valley is deceptively low. Unlike the Soquel-Aptos and Pajaro areas, population in the San Lorenzo Valley tends to not be evenly distributed. As a result, large areas of timberland contain few inhabitants, while other areas contain or are abutted by fairly large number of people. In fact, portions of the Valley are now considered urbanized (averaging greater than 1,000 persons/square mile). Again, the waters of this area are used to supply significant numbers of people with water service.

The Soquel-Aptos and Pajaro areas are fairly similar with evenly distributed populations currently creating relatively few direct conflicts with timber activities. Recently proposed large-scale harvests in the Soquel area, however, have raised significant public concerns. Again, major existing or planned water diversions are located within these watersheds.

The location of such large numbers of people in the county forest lands has created a conflict in land use, both from direct and indirect causes - a topic discussed later in the Timber Management Element (Chapter VI).

SYNOPSIS OF A TIMBER HARVESTING OPERATION

Every tract of forest land is different and, as a consequence, every timber harvest operation is unique. Most harvests, however, involve a similar set of procedures, and have the potential to generate a similar set of impacts. The following discussion presumes an average harvest in Santa Cruz County today.

A registered Professional Forester designs the timber harvest "layout", determining where truck roads, major tractor roads and landings will be sited and constructed. The level of cut in the various stands is determined and the individual stems are marked for cutting. Success or failure of the harvest in the broadest sense is largely determined by the forester's decisions in harvest layout long before any timber is cut.

Logging usually begins with road building. Vegetation is cleared and disposed of along the proposed roadway, earth and rock are excavated and placed as fill or sidecast as spoils, drainage structures are installed, subgrade surface configuration is finalized, and surfacing, if any, is laid. Major tractor roads and landings are also constructed at this time.

Tree falling, bucking, limbing, and slash disposal usually occur concurrently. Marked trees are felled, limbs are severed, and the central stem is cut into appropriate length logs. Limbs and tops may be treated completely or only partially at this time; in any case, all such slash must be reduced to within 30 inches of the ground by April 1.

Logs are generally yarded by tractor or rubber-tired skidder to landings, often downhill. Usually this means physically dragging logs, several at a time, from where they fall to the landings.

Some harvests are planned for skyline yarding or some variation using a tower and cables. Logs are yarded uphill somewhat like a ski lift. This approach makes environmental sense on steeper slopes, but is not possible in many situations.

Once logs arrive at the landing, whether by tractor or cable, they are loaded onto log trucks and hauled to the mill. Typically, in Santa Cruz County, little or no sorting of logs at the landing occurs, so landing size need not be greater than about 1/4 acre (100 ft. x 100 ft.). Logs are hauled along private roads on the landowner's parcel, private roads over which the landowner has a right-of-way (a road association may or may not be involved) and public (city, county and state) roads.

Erosion control and slash disposal are the final steps. Waterbars are installed at appropriate intervals on the roads. Slash may be used to protect bare surfaces from raindrop impact, to slow overland flow, and to trap sediment. Seeding and mulching are sometimes used in sensitive areas. All slash must be reduced to within 30 inches of the ground surface by April 1 of the following spring. Often this work is done by hand crews during winter.

The environmental success of the harvest is the responsibility of the landowner, forester, and logger. If appropriate, tree seedlings will generally be planted during the first winter. Care needs to be taken that slash crews or tree planting crews do not damage erosion control structures.

CHAPTER II

THE FOREST ECOSYSTEM

The Pacific coast conifer forest is a significant resource for the Santa Cruz Mountains. Throughout this area exists a unique combination of proper climatic and soils conditions and an extraordinary local conifer gene pool. As a result, the coastal redwood forest may have the potential to grow timber at a rate which exceeds that of most other areas of the world.

This chapter serves as an introduction to those factors which contribute to forest growth, including climate and soils. It also gives a brief species by species description of the important conifer and hardwood species found in the Santa Cruz Mountains. Lastly, it gives a brief description of the stand structures, their historic changes, and anticipated future composition.

ENVIRONMENTAL FACTORS AFFECTING TIMBER GROWTH: SOILS AND CLIMATE

A combination of poorly consolidated, folded, and faulted bedrock, and a warm, moist climate have contributed to a rapid rate of soil development on the slopes of the Santa Cruz Mountains. Surface erosion and mass movement also proceed at comparatively fast rates, so the Santa Cruz Mountains are characterized by both relatively shallow soils on steep slopes and ridges, and deep soils on gentler slopes and in troughs.

Most bedrock parent materials from which the soils of the Santa Cruz Mountains have formed weather to produce timber soils of great natural fertility. With a few exceptions, mineral nutrients demanded by forest trees are plentiful and soils have good structure. These soils, and to some extent the highly fractured and crumbling bedrock beneath, are capable of absorbing and holding substantial amounts of water for use by trees during the summer drought.

The mantle of soil and partially decomposed bedrock within reach of tree roots may be thought of as a sponge with a fixed capacity to hold water. In general, a deeper soil will be capable of providing more water and supporting a more dense, faster growing timber stand. In most instances, in Santa Cruz County, the inherent productivity of forest soils in terms of the wood fiber volume which they can produce per acre per year is substantially a function of the soil's water holding capacity, i.e., the size of the sponge.

Most of lowland California, including the redwood belt of coastal northern California, has a subtropical Mediterranean climate. Winters are rainy and mild; summers are rainless and warm to hot. Altitude and proximity to the coast further define three zones within a Mediterranean climate: fog belt, mild summer, and hot summer. (Lantis, et. al., 1973) The fog belt phase and mild summer phase cover most of Santa Cruz County, with the exception of a few higher elevation ridges, which experience enough cold in winter that they do not meet the subtropical definition, and have been termed summer dry uplands. (Ibid) During winter, sufficient rain usually falls throughout Santa Cruz County to thoroughly saturate forest soils. Once this occurs, additional rainfall cannot be stored in soil and rock, runs off, and contributes little to the support of forest vegetation.

The nature of summer drought strongly determines the character of forest stand structure, composition, and productivity. The duration of summer drought is critical, and is governed by the dates of the last spring rain and the first fall rain. In order to survive and compete in Santa Cruz County, a tree must be capable of enduring both annual moderate-length drought and occasional extraordinary-length drought, and must be capable of establishing some

seedlings during occasional years of short summer drought. Two factors mitigate severity of summer drought independent of its duration: coastal fog and the inherent waterholding capacity of soil and rock. Coastal fog works in two ways to mitigate drought: the fog reduces temperatures and raises humidity, thereby reducing the demand which trees place upon scarce water supplies; and the fog may provide substantial "fog drip" which acts like a summer shower as tree crowns become a site for condensation of the fog mist. (The impact of fog is particularly significant in terms of defining the range of redwood. A common expression is: "Where the fog blows, the redwood grows.") Deeper soils, usually a function of topographic position, also mitigate drought in a sense by acting as a "larger sponge." Sites with great waterholding capacity can provide more water for trees for longer periods into the drought season. These are usually the sites where commercial stands of redwood are found.

The above environmental factors and fire have created a complexity of vegetative communities over time which is not usually found in commercial forest areas. The redwood belt is characterized by an intricate mixture of redwood-dominated forest, Douglas-fir/hardwood forest, hardwood-dominated forest, chaparral brushfields, grasslands, and various successional communities. Forestry in the redwoods and elsewhere in Santa Cruz County involves a recognition of the productive potential of each of these communities and the development of strategies for realizing that potential.

Timberlands of the redwood belt and Santa Cruz County exist in a climatic and geologic environment which is near perfect for conifer growth. However, the potential for the production of prodigious quantities of extremely valuable softwood timber has yet to be realized.

THE PACIFIC COAST CONIFER FOREST

There exists along the Pacific Coast of North America, from southern Alaska to central California (Figure 2), a conifer forest which is on a scale that transcends all other conifer forests on earth. (Waring and Franklin, 1979) This forest accumulates biomass in greater quantities than tropical hardwood forests, both on an individual tree basis and on a per acre basis. It has the potential, under sustained yield management, to produce fantastic quantities of extremely valuable softwood timber for unlimited periods.

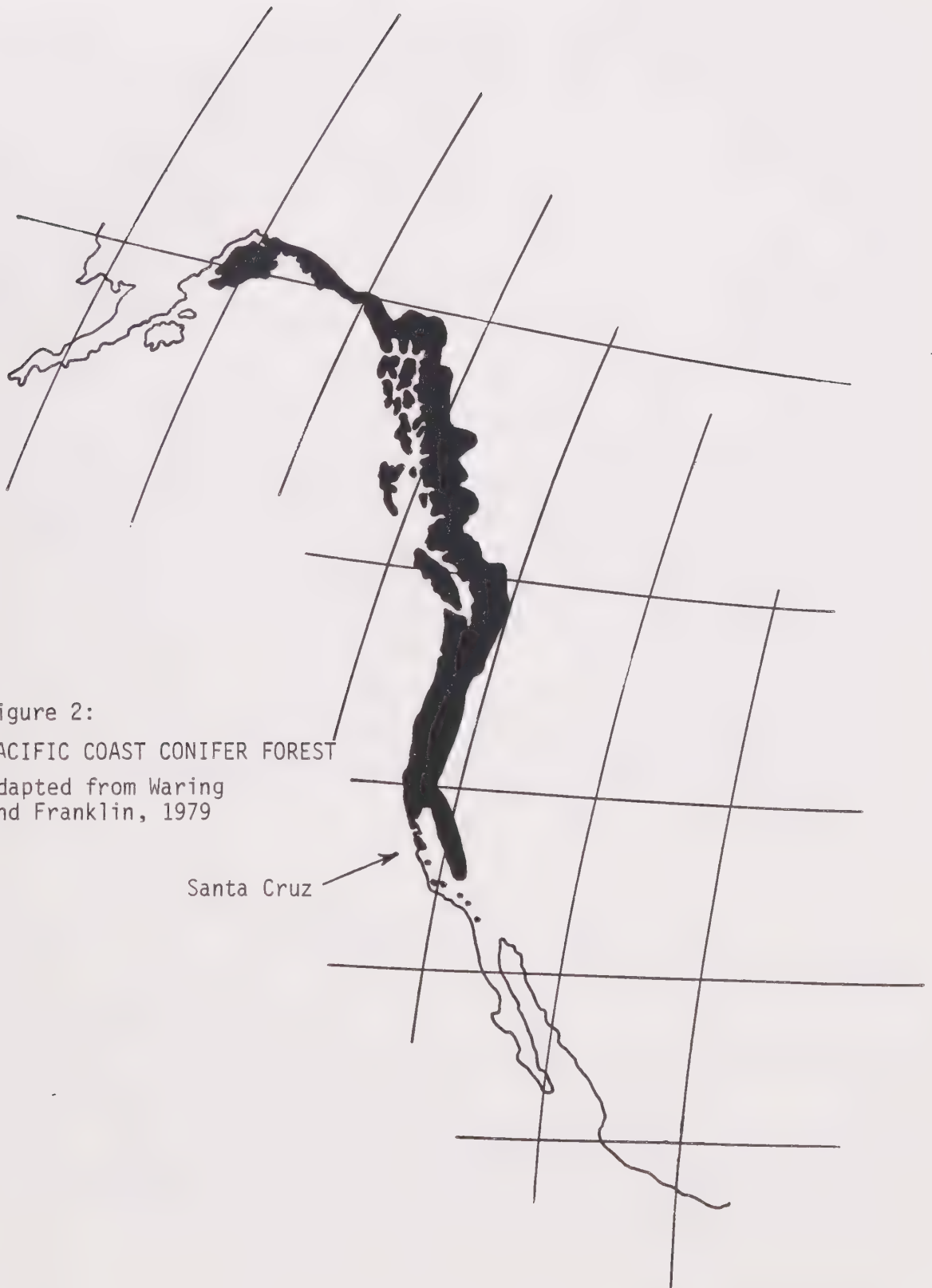


Figure 2:
PACIFIC COAST CONIFER FOREST
Adapted from Waring
and Franklin, 1979

Santa Cruz

The redwood/Douglas-fir/hardwood forests of the Northern California Coast Ranges are a part of the Pacific coast conifer forest, which also includes the relatively pure Douglas-fir forests of western Oregon and Washington and the mixed conifer forests of the Sierra Nevada. Santa Cruz County timberlands share with other parts of this forest a unique attribute: superlative genes which allows high value species to grow large rapidly. While the tree growing environment of the redwood belt is excellent, it is the presence of unique conifer genes which is of even greater importance to future timber production.

The conifers of the Pacific Coast of North America are remnants of a time when trees worldwide were much larger and dominated the landscape more than today. Elsewhere these genes have not survived. (Axelrod, 1976)

Species Descriptions - Santa Cruz Conifers

Redwood

Botanic name: Sequoia sempervirens (D. Don) Endl.

Range: Extreme southwestern Curry County, Oregon, to
Monterey County, California

Redwood stands occur only in California and only in Del Norte, Humboldt, Contra Costa, Alameda, Mendocino, Sonoma, Napa, Marin, San Mateo, Santa Clara, Monterey and Santa Cruz Counties. Redwood grows on coastal terraces, lower mountain slopes, and alluvial flats within the fog belt, but not immediately on the coast. Pure stands are relatively rare. Typically, redwood forms two-canopied stands with varying amounts of other upper canopy conifers and substantial amounts of mixed hardwoods in a lower canopy. Stand structure is similar to the adjoining mixed evergreen forest. (Sawyer, Thornburgh, and Griffin, 1977) Very productive sites may consist of nearly pure redwood, but such stands are rare.

The tallest living thing on earth is a redwood growing on Redwood Creek, Humboldt County. Only the Sierra bigtree (*Sequoiadendron giganteum*) excels redwood in stem diameter and biomass volume. Under management, no tree has the potential to produce a more valuable sustained yield timber crop.

Redwood ecology is complex and controversial. The species is tolerant of shade, and very well adapted to fire, flooding, and landslides. Redwood reproduces vigorously by sprouting, maintaining a tenacious hold on its range,

but spreads slowly due to low seed viability and demanding seedling survival conditions. Its longevity, double that of Douglas-fir, allows it to endure after competitors have succumbed to old age.

Douglas-fir

Botanic name: Pseudotsuga menziesii (Mirb.) Franco

Range: Central British Columbia southward to central Mexico in the Rocky Mountains and to central California in the Sierra Nevada and Coast Ranges. Commercial stands occur throughout western North America including the mountains of northern California north of Santa Cruz and Tuolumne Counties.

Douglas-fir is the most significant conifer associate of redwood and is the dominant conifer in mixed evergreen stands (Douglas-fir/hardwood) inland from redwood. Such stands are fairly common in Santa Cruz County. In the Sierra Nevada, Klamath Mountains, and southern Cascades, Douglas-fir participates in a mixed conifer forest. In most of western Oregon and western Washington it plays a dominant role in the extensive, highly productive commercial forests of that region.

No conifers exceed Douglas-fir in dimensions (height, diameter, volume) except redwood and the Sierra bigtree. It is the champion of the pine family. Douglas-fir is only slightly less productive and valuable per board foot than redwood. It is the dominant tree over the huge central portion of the Pacific coast conifer forest.

Douglas-fir timber produces superlative structural lumber and plywood, better than redwood for many purposes, stronger and more durable than the pines. It is a worthy associate in our Santa Cruz County managed stands, especially on sites that are more arid and colder than optimum for redwood growth.

Ponderosa pine

Botanical name: Pinus ponderosa Laws.

Range: Ponderosa pine ranges throughout the mountains of western North America, generally on more arid sites than Douglas-fir. Its finest development occurs in association with sugar pine on the west side of the Sierra Nevada. In the pine genus, ponderosa pine is second only to sugar pine in height, diameter, volume, and value of lumber.

Ponderosa pine is prominent in Santa Cruz County on inland marine sands, where it is a component of a unique forest ecosystem containing rare, threatened, and endangered trees, shrubs, and herbs. Ponderosa pine may be of future value for planting on more arid sites. Its juvenile growth is very rapid.

Other conifers

Several other native conifers may ultimately prove to be of value for timber production in unusual circumstances (low fertility soils, immediate coast) or where timber production is a secondary use.

Monterey pine (Pinus radiata D. Don), native to Waddell Creek, has been planted widely for landscape purposes in California and is of substantial importance to forestry in the southern hemisphere. It may be of value in immediate coastal areas, perhaps mixed with Monterey cypress (Cupressus macrocarpa Hartw), a native of the Monterey Peninsula.

A similar pine-cypress mixture for excessively drained inland sites may be knobcone pine - Santa Cruz Cypress (Pinus attenuata Lemm. - Cupressus abramsiana C.B. Wolf).

Species Descriptions - Santa Cruz Hardwoods

While the genetic potential of Santa Cruz County conifers is unparalleled, the hardwood potential is weak and results in relatively low growth rates in comparison. Although native hardwood trees have considerable forestry value, their major worth does not lie in potential for future sawtimber production. Their growth rate is relatively poor and the value of the wood produced is low.

Six native hardwood species are widespread and represent major components of Santa Cruz County forest stands. (Griffin and Critchfield, 1972)

Tanoak

Botanic name: Lithocarpus densiflora (Hook, and Arn.) Rehd.

Range: Coast ranges, Umpqua River, Oregon, to southern California.

TABLE 1*

Typical and Maximum Ages and Dimensions
3 Important Santa Cruz County Conifers
(Waring and Franklin, 1979)

REDWOOD

Typical age:	>1250 years
Typical diameter:	60 - 150 inches
Typical height:	250 - 325
Maximum age:	2200 years
Maximum diameter:	195 inches

DOUGLAS-FIR

Typical age:	>750 years
Typical diameter:	60 - 85 inches
Typical height:	230 - 260 feet
Maximum age:	1200 years
Maximum diameter:	170 inches

PONDEROSA PINE

Typical age:	>600 years
Typical diameter:	30 - 50 inches
Maximum age:	725 years
Maximum Diameter:	105 inches

*Mature timber within the heart of each species' range, illustrating potential rather than actual timber dimensions. See Table 6 for actual dimensions of Santa Cruz County young growth.

Tanoak is the most important hardwood tree of Santa Cruz County timberlands, northwestern California and southwestern Oregon generally. It is the most common understory tree in redwood and mixed evergreen stands, becoming increasingly less important grading into mixed hardwood stands. Tanoak played a key role in local prehistory: its acorns were essential and preferred food for Native Americans.

Tanoak is highly shade tolerant, more so than redwood. It does not vigorously invade chaparral or cleared forest, but slowly establishes many seedlings and shrubby young trees under both redwood and Douglas-fir upper canopies. It is increasing rapidly in Santa Cruz timber stands. (Pillsbury, 1979) It is faster growing and straighter than live oak or madrone, but it demands growing conditions which usually place it more directly in competition with conifers. Yet, its ubiquity and tenacity suggest that forest management strategies will have to accommodate its presence.

Madrone

Botanic name: Arbutus menziesii Pursh

Range: British Columbia to California. Very prominent from about Umpqua River south in coastal conifer dominated forests and associated hardwood forests.

Madrone is a most striking and beautiful tree. It is distinguished by its red, papery bark, peeling off in mid-summer to reveal a green-cream layer underneath; its bright green, glossy leaves turning yellow, with brown and red in mid-summer; its white blossoms in early spring; and bright red berries in fall and winter. Madrone is never mistaken for its less colorful associates. Of little saw-timber value, madrone contributes significantly to wildlife and forest aesthetics.

Coast live oak and interior live oak

Botanic names: Quercus agrifolia Nee

Quercus wislizenii A. DC.

Ranges: Coast live oak grows in pure and mixed stands near the central and southern California coast. Interior live oak ranges widely inland in central California.

These two evergreen oaks are closely related and often grow together. Live oaks dominate live oak forest; are prominent in mixed hardwood and mixed evergreen forest, and sometimes prominent under redwood.

Although of great aesthetic, wildlife, and conservation value, live oaks are not promising as sawtimber trees.

Bigleaf maple

Botanic name: Acer macrophyllum Pursh

Range: Coastal North America from British Columbia to California. California North Coast Ranges and northern Sierra Nevada, becoming more scattered in central and southern California.

Bigleaf maple is restricted to moist areas in Santa Cruz County. Its form and relative shade tolerance make it a valuable and very beautiful understory hardwood if such a tree is desired for planting on moist sites.

Bay

Botanic name: Umbellularia californica (Hook, and Arn.) Nutt.

Range: Coastal southwest Oregon, coastal California, and lower Sierra Nevada.

This tree is called myrtle in Oregon, pepperwood in northern California, bay in central and southern California, and California-laurel by botanists. Bay is semi-riparian and extremely shade tolerant, but not as widespread as the oaks, tanoak, or madrone.

Bay has fairly good form and has more potential for production of valuable timber than many other hardwoods. Unfortunately, like maple, it does not generally inhabit dry sites, although exceptions can be found.

Blue gum

Botanic name: Eucalyptus globulus Labill

This introduced Australian tree is the largest and tallest hardwood in the world, and has become a dominant feature of coastal California landscapes. Maligned by the ecologist, and historically a disappointment to foresters due to difficulties processing its sawlogs, blue gum presently produces

significant amounts of pulp chips and may shortly be of real value as a renewable energy source.

Hardwoods Summary

More than a dozen additional hardwoods are native to Santa Cruz County, but none appear to hold significant potential for timber production. All are of value locally for non-timber reasons.

Although native hardwood trees appear, with minor exceptions, to be of little potentially value as crop trees compared to native functions which should not be overlooked. Hardwoods may be managed as a part of future conifer-dominated stands for their value in nutrient cycling, slope stability, wildlife, and aesthetics. In addition, they can produce valuable fuelwood, chips, and chemicals.

Hardwoods should not be eradicated, but they need not be allowed to dominate stands which could support an increased conifer component. Many forest stands in Santa Cruz County would produce a greater annual income if they were stocked with more conifers and fewer hardwoods.

Varieties of Stand Structure

The structure of forest stands in Santa Cruz County is not consistent, but a unifying theme runs throughout. Regardless whether a forest stand is dominated by old-growth redwood or young-growth madrone, a two-canopied structure typically occurs or is in the process of developing. (Two-canopied stands have two discrete tree canopies comprised of mature trees. These "canopies" are distinct from forest "understories" comprised of shrubs and tree regeneration.)

The terminology becomes confusing, but it is clear that a structural similarity, regardless of species composition, exists among most coastal California forest stands, including those of Santa Cruz County. Most forests either exhibit, or are trending toward, a two-canopied structure with a conifer upper canopy and a hardwood lower canopy. Each canopy is strongly influenced by the other, yet is also somewhat independent. Vegetation succession can be more easily perceived if it is understood to be occurring simultaneously, but interrelatedly, in each canopy.

Santa Cruz County's timberlands are not characterized by vast, uninterrupted expanses of homogeneous stands. They support a complex mosaic of several species mixes and stand structures with the interspaced patches of brushland and grassland. For timber management planning purposes, the following

breakdown is proposed to analyze opportunities for increased future production of timber in Santa Cruz County:

- I. Two-canopied forest
 - A. redwood / mixed hardwood
 - B. redwood, Douglas-fir / mixed hardwood
 - C. Douglas-fir / mixed hardwood
- II. One-canopied forest
 - A. mixed hardwood
 - B. pure live oak
- III. Woodland
- IV. Chaparral
- V. Grassland

Two Canopied Forests

Two-canopied forest stands are composed of mature conifers in the upper canopy and mature hardwoods in the lower canopy. Seedlings, saplings, and pole size trees of both canopies may occur as components of an understory along with a variety of shrubs and herbs.

Substantial forested acres of Santa Cruz County support an upper canopy of pure or nearly pure second growth redwood with a lower canopy of mixed hardwoods, particularly tanoak. These stands are often found on the more productive, moister sites. Typically, little or no seedling redwood regeneration is found, but abundant tanoak seedlings or shrubby tanoaks are spread about. (Pillsbury, 1979)

Also common are stands in which the upper canopy is composed of a mixture of second growth redwood and Douglas-fir. Often the hardwood lower canopy in such stands is more diverse and the upper canopy is less dense. Conifer regeneration and young conifers are more prominent. These stands may occur

more often on slightly drier sites than pure, dense redwood. Less common are stands of Douglas-fir over a hardwood lower canopy.

One-Canopied Forests

Two-canopied forests are sometimes strongly dominated by the upper canopy (especially on wetter sites) or sometimes carry only a scattering of conifers over nearly continuous hardwood lower canopies. In extreme cases, scattered conifers blend into one-canopied mixed hardwood stands. These mixed hardwood stands are often virtually indistinguishable from the owner canopy of two-canopied stands in terms of species composition and successional dynamics, suggesting that they may have carried a conifer component, perhaps Douglas-fir, in the recent past.

On drier sites, mixed hardwood stands become increasingly less species rich until they become almost pure live oak. But even in this condition, scattered or even occasional heavy conifer upper canopies are encountered. It appears that any pure conifer stand or any pure hardwood stand will develop into a two-canopied stand in time. (Sawyer, Thornburgh, and Griffin, 1977) This may not be true for the extreme cases of very dry site live oak stands or very moist site pure redwood stands.

Woodlands and Grasslands

Woodland and savanna form a transition between forest and grassland. They may represent either stable or transitional conditions. In many cases, woodlands and savannas are being invaded by brush species, especially coyote bush and poison oak, and forest trees. This is also true of grasslands. Many of these woodland, savanna, and grassland communities are probably of human origin, either White or Native American. Without continued human intervention (burning, livestock grazing, and agricultural clearing), they have been succeeding to forest, some quite rapidly.

Chaparral

Chaparral brushfields occur on many of the more severe sites in the Santa Cruz Mountains, especially on steep, dry, south-facing slopes. This vegetation may result from an extremely dry, shallow, rocky, nutrient poor soil or may simply be the result of repeated fires, invasion of brush after logging, agriculture, cessation of grazing, or recent landslides. Future management potential of chaparral brushfields for timber production depends substantially upon their origin. A careful field assessment is needed to determine the potential future productivity of chaparral brushfields on a site-specific basis.

HISTORIC TRENDS WITHIN THE SANTA CRUZ FOREST

Before the Gold Rush

The structure and composition of Santa Cruz County forest stands and intermingled brush and grasslands were once controlled substantially by non-human environmental factors previously described: climatic and geomorphic processes. Over the last 10,000 years, human intervention has become increasingly influential in determining the structure of stands and the spatial relations among components of the vegetative mosaic.

Forests with structures not unlike the modern forests of Santa Cruz County occurred widely in western North America in the Eocene, 48 million years ago. Modern species had not yet evolved, but modern genera had. These trees formed mixtures of conifers and hardwoods which were more complex and species-rich than any modern forest. The climate over all of North America was moist and mild, ideal for forest growth. (Axelrod, 1976)

Since that time, a trend toward more climatic diversity and mountain-building has caused most western North American forests to retreat to favorable sites and to lose species diversity. The Pacific coast conifer forest, however, retains much of the Eocene character, particularly with regard to size traits. Greatest species diversity of both conifers and hardwoods is retained on the coastal slopes of the Klamath Mountains. (Whittaker, 1961) Santa Cruz forests are not quite as species-rich and complex as coastal forests at about 42 ° N latitude (California-Oregon line) but still maintain much of their original diversity, complexity, and productivity.

The advance of Pleistocene ice periodically pushed the forests across the landscape toward lower altitudes and latitudes. Warm interglacial periods produced a rebound of forests northward and into high mountains with an invasion of desert, grassland, and chaparral into recently forested areas. The most recent ice retreated 10-12,000 years ago, subsequent to the time Asians first arrived in North America. Native use of fire may have assisted the retreat of forests and helped define the ecotones between vegetation communities.

A climatic maximum was reached in terms of heat and aridity about 4,000 years ago. Since then, conditions have become more cool and moist. Early Spanish settlers in Santa Cruz County encountered forest communities whose structure was very ancient but in which the location of forest and brushlands had been dramatically influenced by fluctuating climate and the practices of Native

inhabitants. The forest stands the Spanish saw in 1780 were essentially the same as the Asian settlers saw 10,000 years before, but they had been substantially rearranged.

The Spanish encouraged the Natives to reduce burning, introduced Old World domesticated grazing animals and began cutting firewood and timber. The direct Spanish impact on Santa Cruz forests, however, was not great.

The Gold Rush to World War I

The Gold Rush and the rapid transformation of San Francisco from a small village into one of the world's great cities marked the beginning of an era of strong demand for redwood lumber which has continued substantially unabated for 130 years. The Santa Cruz Mountains between 1850 and 1915 experienced a period of exploitation of old growth stands brought about by a sense of unlimited timber resources and a total unawareness of the concept of resource conservation. The first timber harvests were constrained only by stumpage markets and the prevailing technology. It was an era of timber mining for short-run profit.

Most of the old growth redwood was cut between 1850 and 1915 using methods which now seem both colorful and wasteful. The best timber grew along the rivers and creeks and thus it was natural that railroad track was laid up drainages and adjoining timber was dragged down to the rails. Oxen were used initially, giving way to the stream donkey, which was a system using cables to yard timber downhill. It was common practice to burn the forest initially to facilitate logging, and to reburn it after logging to eliminate fire hazard next to uncut stands. Temporary dams were often constructed to form ponds to hold logs. These were then destroyed, allowing the water to transport the logs down the creek.

Before 1915, Santa Cruz County was a major producer of timber and timber products for an expanding urban population in a prosperous state. Logging was extremely laborious and dangerous, appallingly wasteful of timber, and wholly unconcerned about long-term effects on the environment and future timber production. With the exception of a few State parks, Santa Cruz County was essentially clearcut and burned prior to modern times and the nationwide acceptance of utilitarian conservation as good policy.

Modern Santa Cruz

A significant land management policy which significantly changed the direction of timber management was the institution of government-funded fire control. This was done largely to improve the investment potential for second growth forestry enterprises. It has the effect of decreasing fire frequency substantially, thus allowing grasslands to succeed to brush and hardwoods. After logging, most redwood stumps sprouted, creating today's densely stocked clumps with little if any seedling redwood in between. Most hardwoods also sprouted from their stumps and brush and herbs seeded in. After a couple of decades, young stands were not too different from old growth in terms of species composition and numbers of stems of each species. They were very different, however, in terms of canopy dominance. Clearly, in young second growth stands, the hardwood lower canopy is much more dominant than it was in the old growth stands or than it will become as the second growth stands mature. Many Santa Cruz County second growth stands are characterized by widely spaced, dense clumps of redwood, with the intervening ground being taken up by overly dense hardwoods.

The most notable example of a species which may have lost ground during the nineteenth century logging and burning is Douglas-fir. This member of the pine family does not sprout from cut stumps: it reproduces only from seed. Douglas-fir is well adapted to an environment in which there are occasional devastating fires. Excellent seedbeds are created by fire, and Douglas-fir will reproduce in profusion if sufficient seed trees are spared by the holocaust, which is typically the case even in the most disastrous treetop fires. However, it cannot endure repeated fires at short intervals, especially if seed trees are removed by logging. This process has recently eliminated Douglas-fir from many acres of forest in Humboldt and Mendocino Counties, and may very well have done the same in Santa Cruz. When Douglas-fir is lost, it cannot play the role of a conifer fill-in between widely spaced redwood young growth clumps or the role of exclusive upper canopy conifer in stands which are thereby reduced to mixed hardwoods. The present structure of young second growth stands of more northerly redwood counties, many logged within the last several decades, strongly suggests that Douglas-fir's role in Santa Cruz may have been radically reduced by nineteenth century practices.

Future Forests

Within the last several decades, increasing acres of Santa Cruz County second growth timber have grown to sufficient size and have produced enough board-foot volume per acre that timber harvesting has increased substantially in the county. (Oswald, 1979) Under existing Forest practice rules, these second

growth stands are not clearcut, but rather are partially cut with conifer removals amounting to roughly half the timber stand.

The following stand structure and composition changes have been occurring and/or may be anticipated to begin occurring:

- Conifer components of stands are becoming more mixed in terms of diameter and age classes represented. They are being converted from even-age to uneven-age stands.
- In most cases, conifers are not being planted between redwood clumps, although this practice is on the increase.
- In most cases, hardwoods are not being harvested except when damaged by conifer logging. Thus hardwood canopies are remaining substantially even-aged.
- Tanoak is establishing naturally in the understory in many areas.

Conifer growth vastly exceeds hardwood growth, so even though conifers are being harvested and hardwoods are not, conifers still continue to increase their dominance of stands. Their dominance would increase more rapidly if hardwoods were harvested in significant volumes.

In summary, rates of change differ among various stands depending on present structure and composition, soil productivity, and details of the allowed cut. But although these factors influence rate of change, the direction of change appears to be following these trends:

- Increasing dominance of the conifer upper canopy over the hardwood lower canopy.
- The conifer component is shifting toward redwood preeminence although Douglas-fir young growth is doing well in present heavily stocked hardwood stands.
- The hardwood component is shifting significantly toward tanoak.
- Both canopies are shifting from even-age to uneven-age.

The significance of these trends will be discussed in later chapters relative to management practices on timberlands.

CHAPTER III

SILVICULTURE AND TIMBER YIELD

Silvicultural rules developed and enforced under the authority of the California Forest Practice Act presently specify that the forests of Santa Cruz County shall, in most cases, be harvested only under a single silvicultural system - selection. As a result, management of timberland here has become much more complex than areas where other methods are utilized (e.g. clearcutting). Likewise, use of the selection system complicates the analysis of the various factors critical to the development of elements of timberland management planning. Calculation of growth rates, yield per acre, and countywide harvestable yield are complex and subject to wide disagreement.

This chapter explains the concept of selection silviculture and factors which can be manipulated to arrive at various timber stand structures. It then presents a summary of available timberland inventory data, and an analysis of what the data suggests relative to present and possible future yield. (Tables of relevant data are supplied at the end of the second section of the Chapter.)

REDWOOD SILVICULTURE IN THE SANTA CRUZ MOUNTAINS

Selection Silviculture

Commercial timber harvesting in the Santa Cruz Mountains is unique in that silvicultural practice has not been left up to the forester, landowner, or logger. This is not the case throughout a majority of California nor elsewhere in the Nation, with perhaps a few exceptions. The Santa Cruz Mountains may be the prime example of a substantial acreage of privately-owned timberland in the United States for which the silviculture has been determined by government - in this case by the State Board of Forestry.

Academically, four silvicultural systems are generally recognized. They are named for the manner in which regeneration is established, which usually occurs at the time the bulk of the crop is harvested. In practice, variations, modifications, and combinations of these systems are the rule. The classic systems are: clearcut, seed tree, and shelterwood (which each produce even-age stands), and selection (which produces uneven-age stands). In clearcutting, all timber and undesirable vegetation are removed. The idea is to maximize sunlight and minimize competition for seedlings which are often established by planting. A seed tree cut leaves a few healthy, fertile trees per acre to provide seed for natural regeneration. After regeneration is established, the seed trees are removed. A shelterwood cut leaves enough healthy, fertile trees to produce the mix of sun and shade needed for optimum establishment of the desired species. Again, the residual is removed once regeneration is established, usually within a decade. All three methods produce the same thing - an even-age young stand.

Present day stands in Santa Cruz County are mostly even-age because the County was essentially clearcut in the nineteenth and early twentieth centuries. Even-age stands result when the bulk of the forest is removed within a short period of time and all the regeneration is immediately or shortly established. This is by far the more common situation in nature, and most western North American timber trees are well adapted to one of the even-age approaches.

The classic selection system creates or perpetuates uneven-age stands by frequent removals of small volumes and frequent stimulation of small quantities of regeneration. Some trees are cut from each age class every time the stand is entered, so it is "thinned" and "harvested" simultaneously. Generally, species whose regeneration is shade tolerant are well adapted to the selection system. The selection system is often recommended when non-

timber values of forest management are significant. This is the case in the Santa Cruz Mountains where soil erosion, water quality, and aesthetics are paramount issues.

As with all the academic silvicultural systems, the theory behind the selection system was developed with European forests in mind. As conceived and practiced in the Santa Cruz Mountains, the selection system has been substantially modified to reflect local conditions and the unique biology of redwood.

Two attributes of redwood make it unique among the important commercial timber trees of California. Like most hardwoods, but unlike most conifers, redwood stumps sprout after cutting; and, unlike most commercial conifers, redwood is sufficiently shade tolerant that young sprouts (or seedlings when they occur) do not demand full sunlight for proper growth. The fact that redwood stumps sprout means that one of the more difficult parts of timber management, establishing regeneration, is no problem at all. And the species' tolerance of substantial shade means that considerable latitude in choosing the density of the residual overstory may be exercised. If redwood were not shade tolerant, the selection system would not be feasible.

In the view of some foresters, many second growth redwood stands are too sparsely stocked, that is, clumps of sprout regeneration established after the old growth was cut, are too widely spaced. Yet while the stand may be sparsely stocked, the clump may be overstocked. Simply cutting the clump under the selection system, while solving one problem, does nothing about stocking the interstices between clumps. Often the forester will choose to plant seedlings between clumps to increase stocking within the stand. Once these trees mature and are cut, sprouts will emerge and a new, permanent clump will be established.

While arguably complicating timber management, the selection system provides an extremely high level of soil and watershed protection and maintains a continually forested landscape. Few professional foresters in the Santa Cruz Mountains now argue for the abandonment of the selection system, but opinions vary regarding how the system should be applied and what are appropriate goals.

Some foresters believe that stands should be kept relatively open to maximize diameter growth. Others believe that stands should be kept relatively dense to maximize wood volume growth. Still others believe that landowner income or return on investment should be maximized.

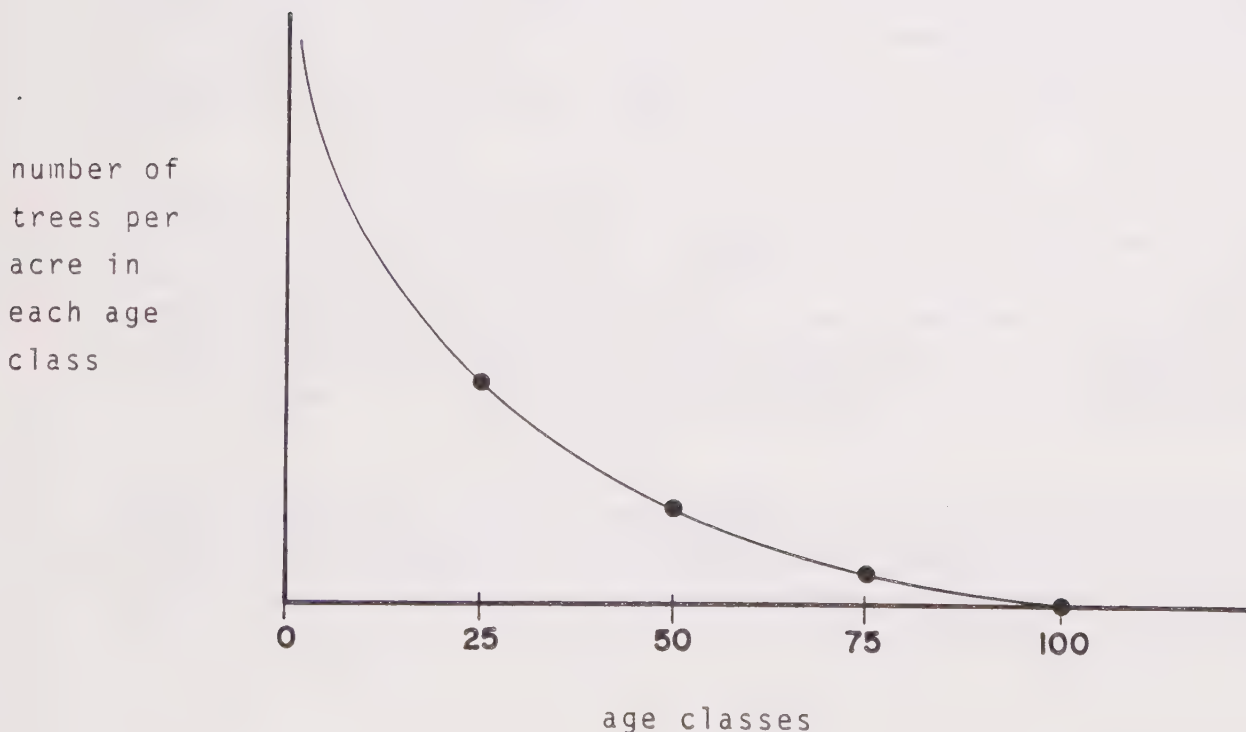
Developing Stand Structure

The concept of "rotation" and "cutting cycle" are very important to an understanding of selection silviculture. Rotation age is the maximum age which trees are allowed to reach in the stand. Not all trees are allowed to reach rotation age, but none are allowed to exceed it. Under the selection system, when sufficient control has been exercised over stand development, and when sufficient growth data are at hand, it is possible to specify a maximum diameter rather than a rotation age to govern harvesting.

Cutting cycle is the interval between harvests. At each harvest each age class is cut in an attempt to achieve a balance between the growing space occupied by each. That balance is expressed by a logarithmic curve defining the number of trees in each age class (see figure 3 below). During harvest, each age class is cut to the specifications of the next larger class, and "graduates" to the next class.

FIGURE 3

DISTRIBUTION OF TREES PER ACRE PER AGE CLASS IMMEDIATELY AFTER A SELECTION HARVEST (ROTATION = 100 YEARS, CUTTING CYCLE = 25 YEARS, NUMBER OF AGE CLASSES = 4)



Once the relationship in the particular stand between diameter growth and age is known, then age classes can be expressed as diameter classes, and vice versa. The relationship is a function of stocking and site. The number of age classes times the cutting cycle must equal the rotation age.

Table 2 presents various examples of stand structure which may be developed throughout the Santa Cruz Mountains. Each possible structure is accompanied by a brief description of its advantages and disadvantages.

SYNTHESIS OF AVAILABLE INVENTORY DATA

Two sources of inventory data are available which characterize the forests of Santa Cruz County and provide answers to some specific questions about their condition and dynamics. Each source views the resource from a substantially different perspective and tries to answer somewhat different questions, but where the data overlap, agreement is substantial. Significant data gaps exist, particularly with regard to the growth potential of less productive forests and brushlands.

In 1979 the United States Forest Service, Pacific Northwest Forest and Range Experiment Station published: Oswald, Daniel D., 1979. Forests and Timber Resources of California's Central Coast.

The Santa Cruz County Planning Department, through a 701 Planning Grant, contracted with Norman Pillsbury of California Polytechnic University, San Luis Obispo, to inventory the County's forests as a first step toward the preparation of the County Timber Management Plan. Pillsbury collected field data in the summer of 1977 and produced: Pillsbury, Norman H., 1979. Timber Inventory, Volume Tables and Growth Estimates for Santa Cruz County, California.

Oswald's report covers the entire central coast, but focuses strongly on Santa Cruz County. His format provides a prose overview of the County's forests, backed up by numerous data tables, several of which are specific to Santa Cruz. He breaks the County down into forest types, discusses stocking and growth, stand structure, and potential productivity. He also deals with ownership. His approach and vocabulary are typical of the inventory information which the Forest Service produces nationwide.

Pillsbury's paper deals with some of the same considerations as Oswald's such as land base, forest type, stocking, and growth. Additionally, he has broken his analysis down on a drainage basin basis, prepared volume equations for

TABLE 2

EXAMPLES OF STAND STRUCTURES POSSIBLE UNDER THE SELECTION SYSTEM

Rotation: 100 years;
Cutting Cycle: 33 years;
Age Classes: 3

A one hundred year rotation will produce high volume growth, with some economic sacrifice. Relatively long cutting cycle means a relatively heavy cut when it occurs, but will stimulate good regeneration and fast growth of young stems. Infrequent income from stand.

Rotation: 100 years;
Cutting Cycle: 10 years;
Age Classes: 10

Relatively short cutting cycle means very light cuts, thus little apparent disturbance to the stand. Such cuts may not adequately stimulate regeneration and/or not provide any space for it to grow. Selection may degenerate into a series of light thinnings of what becomes an even age stand.

Rotation: 40 years;
Cutting Cycle: 13 years;
Age Classes: 3

A short rotation may provide maximum return on investment, but at a cost of wood production. Harvesting this frequently may be uneconomic.

Rotation: 75 years;
Cutting Cycle: 25 years;
Age Classes: 3

This provides somewhat of a compromise between total wood production and return on investment. Age classes are few enough that regeneration should not be a problem.

redwood in each of the basins, developed per acre volume and growth estimates for each basin, and provided local volume tables for each basin. He has produced stand and stock tables for each forest type in each basin which characterize the forest in terms of diameter class and species. These data can be extremely valuable to foresters applying the selection system to Santa Cruz' complex structured stands. Both inventories have been used to produce the following summary characterization of Santa Cruz County forests. (See bibliography for full citations. Also see Bolsinger (1980) for statewide context.)

Forest Land Acreage

In the 1980s, Santa Cruz County's second growth redwood forests have grown to become an extremely valuable resource. Highly productive forest acres are stocked with valuable timber providing high quality sawlogs, clean water, and open space.

The most significant commercial stands of timber in the central coast region are the redwood and Douglas-fir forests of the Santa Cruz Mountains. These forests, intermingled with stands of hardwoods, occupy a mostly contiguous area of 234,000 acres in San Mateo, Santa Clara, and Santa Cruz counties. Within this area are 193,000 acres of commercial forest land not formally reserved from timber production; the remainder has been set aside, primarily in parks. The redwood and Douglas-fir forests of the Santa Cruz Mountains, sites of some of California's earliest commercial timber operations, are the only areas within the central coast where logging is likely to continue on a commercial scale. (Oswald, 1979)

Santa Cruz County is 65% forested; 85% of the forested area is classified by the Forest Service as productive, meaning that it can produce in excess of 20 cubic feet of wood fiber per acre per year. 88% of the productive forest is commercial, meaning that it is productive and available for harvesting timber crops. Thus nearly half of Santa Cruz County is commercial timberland upon which timber harvesting, at some time or other, could be expected to occur. Almost all of this commercial forest is privately owned by individuals and corporations so diverse that the Forest Service can only characterize them as "miscellaneous" (See Table 3).

Growth/Stocking

Santa Cruz second growth redwood is large, averaging 24 inches in diameter at about 75 years. (Table 6) Similarly sized second growth timber is relatively less common in the northern portion of the redwood belt because many second-growth stands there are younger. Santa Cruz' larger logs, relatively dense stands, and lower prices help explain why Mendocino County mills have been willing to haul Santa Cruz timber to Ukiah and further for processing.

The most casual observer will note that Santa Cruz County is substantially forested. More specifically, Oswald has specified that half the County is productive and available for harvest.

Considering the 135,000 acres of commercial forest land, questions immediately arise regarding the current volume and growth parameters of the forest:

- What is the volume of "growing stock" or "biomass" of standing timber? (Similar, but not identical measures). This figure is expressed in cubic feet of wood fiber.
- What is the volume of "sawtimber", i.e., what amount of lumber can be sawn from the standing timber? This figure is expressed as board feet of ultimate useable product.
- What kind of annual net growth is accruing to these two categories?
- What is the growth percent (or internal rate of return) of the forest? (i.e., if the standing volume is considered an "investment", what kind of "interest" does annual growth represent?)

Specific numerical answers to these questions are provided by Tables 7, 8, and 9, and the original documents by Oswald and Pillsbury. Here we sketch a general description of Santa Cruz County's commercial forests, focusing on present standing volume and present growth.

Two-thirds of Santa Cruz County's cubic foot growing stock is redwood. Seventenths of the board foot sawtimber volume is redwood. Although the roles of Douglas-fir and the various hardwoods are not to be ignored, there is some justification for simply calling Santa Cruz a redwood forest. This is

particularly true when it is considered that redwood totally overwhelms all other species in terms of commercial value.

Present standing redwood sawtimber volume countywide is approximately 2 billion board feet. All other species contribute another 3/4 billion board feet, most of which is presently of very little commercial value. The County's standing redwood timber is thus worth hundreds of millions of dollars.

Redwood sawtimber growth amounts to about 60 million board feet annually. All other species contribute an additional 30 million. Estimated potential productivity if all stands were well stocked with conifers is 130 million board feet annually. (Oswald, 1979) Thus Santa Cruz County, in spite of the extreme cutting it received when logged for old growth between 1865-1915, is well stocked with valuable timber growing at a good rate. But clearly, there is room to increase productivity substantially.

Many forest landowners are interested in growth percent, which is similar to an internal rate of return. Santa Cruz County's forests are growing at a rate of 3.25% annually, in terms of sawtimber. Redwood sawtimber is increasing at an annual rate of 3.1%.

Oswald has estimated average County wood volume productivity for commercial forest land at 175 cubic feet per acre per year. More specifically, no commercial acreage produces less than 85 cubic feet per acre and 40% produces in excess of 225 cubic feet per acre. When one considers that average forest land productivity nationwide is 53 cubic feet per acre per year (USDA Forest Service, 1980) and that the State definition of timberland for zoning purposes includes lands producing as little as 15 cubic feet per acre per year, it is apparent that Santa Cruz County timberlands are extremely productive.

Santa Cruz' commercial forest land has the potential, under high intensity management, to be more productive per acre than most other counties in the United States. That the crop is predominantly redwood only serves to emphasize the fact that Santa Cruz County is a special place for timber growing.

TABLE 3
 AREA BY LAND CLASS AND OWNERSHIP
 SANTA CRUZ COUNTY
 JANUARY 1, 1973

	<u>Acres</u>
Santa Cruz County	281,000
Nonforest	99,000
Forest	182,000
Unproductive	28,000
Productive	154,000
Productive reserved (parks, etc.)	19,000
Commercial forest land (productive unreserved)	135,000
Timber Production Zone (TPZ)	57,000
County and municipal	6,000
Forestry industry	2,000
Farmer-owned	7,000
Miscellaneous private corporate	47,000
Miscellaneous private non-corporate	73,000

TABLE 4
FORESTED AREA IN ACRES BY FOREST TYPE AND DRAINAGE BASIN
SANTA CRUZ COUNTY 1977
(PILLSBURY, 1979)

FOREST TYPE*	DRAINAGE BASIN				TOTAL COUNTY
	NORTH COAST	SAN LORENZO	APTOS- SOQUEL	PAJARO	
Conifer	24,158	32,827	12,571	4,326	73,882
Mixed Evergreen	16,853	34,141	15,546	11,972	78,512
Forested Area**	41,011	66,968	28,117	16,298	152,394***

TABLE 5
FORESTED AREA IN PERCENT BY FOREST TYPE AND DRAINAGE BASIN
SANTA CRUZ, COUNTY, 1977

FOREST TYPE	DRAINAGE BASIN				TOTAL COUNTY
	NORTH COAST	SAN LORENZO	APTOS- SOQUEL	PAJARO	
Conifer	15.9	21.5	8.2	2.8	48.5
Mixed Evergreen	11.1	22.4	10.2	7.9	51.5
Forested Area	26.9	43.9	18.5	10.7	100.0

* In this instance, "conifer forest type" means forest where 50% or more of the tree canopy is composed of coniferous trees. "Mixed evergreen forest type" means forest where 50% or more of the tree canopy is composed of hardwood trees.

** "Forested area" (Pillsbury, 1979) means the same thing as "productive forest land" (Oswald, 1979)

*** Oswald (1979) reports 154,000 acres of productive forest land.

TABLE 6
 AVERAGE TREE SPECIFICATIONS
 SECOND GROWTH TIMBER ON PRODUCTIVE FOREST LAND
 SANTA CRUZ COUNTY, 1977 (PILLSBURY, 1979)

<u>REDWOOD</u>		<u>DOUGLAS-FIR</u>
23.8 inches	Diameter at breast height	28.1 inches
106.3 feet	Total height	118.1 feet
106.3 cubic feet	Volume	198.1 cubic feet
472 board feet		1044 board feet
73 years	Age	69.8 years
1904	Year of Inception	1907

TABLE 7

Volume, net annual growth, and growth percent of growing stock and sawtimber by species;
and conversion factors (cubic feet: board feet) of volume and net annual growth by species;
Santa Cruz California, 1973. (Oswald, 1979)

Species	Volume (standing)		Net Growth (annual) ^{1/}		Growth %: growth/volume		Conversion factor: sawtimber/growing stock	
	Growing Stock	Sawtimber	Growing Stock	Sawtimber	Growing Stock	Sawtimber	Volume	Net Growth
	Million cubic feet	Million board feet ^{2/}	Thousand cubic feet	Thousand board feet ^{2/}	%	%		
<u>Softwoods</u>								
Redwood	435	1,932	10,841	61,889	2.2	3.1	4.44	5.71
Douglas-fir	89	469	1,771	9,659	2.0	2.0	5.27	5.45
Knobcone pine	15	31	802	1,315	5.3	4.1	2.06	1.64
Ponderosa pine	7	46	20	141	0.2	0.3	6.57	7.05
Monterey pine	15	80	1,716	11,341	11.3	13.8	5.33	6.61
Total	561	2,558	15,150	84,345	2.7	3.3	4.56	5.57
<u>Hardwoods</u>								
Pacific madrone	35	64	735	1,089	2.1	1.7	1.83	1.48
Tanoak	37	48	1,526	1,746	4.1	3.5	1.29	1.14
Other hardwoods	28	61	771	1,474	2.8	1.6	2.18	1.91
Total	100	173	3,032	4,309	3.0	2.5	1.73	1.42
All Species	661	2,731	18,182	88,654	2.75	3.25	4.13	4.88

^{1/} Growth is for 1972.

^{2/} Scribner rule.

TABLE 8

Area of commercial forest land by forest type, volume, net growth, and growth percent of growing stock and sawtimber by forest type; and conversion factors (cubic feet: board feet) by forest type; Santa Cruz County, California, January 1, 1973. (Oswald, 1979)

Forest type ^{2/}	Area	Volume	(standing)	Net Growth	(annual)	Growth %: net growth/volume		Conversion factor: sawtimber/growing stock	
		Growing Stock	Sawtimber	Growing Stock	Sawtimber	Growing Stock	Sawtimber	Volume	Net Growth
	Thousand acres	Million cubic feet	Million board feet ^{1/}	Thousand cubic feet	Thousand board feet	%	%	Ratio	Ratio
Redwood	68	462	1,968	11,946	61,502	2.59	3.13	4.26	5.15
Douglas-fir	13	65	325	997	4,286	1.53	1.32	5.00	4.30
Knobcone pine	10	14	16	693	589	4.95	3.68	1.14	0.85
Monterey pine	3	22	114	1,716	11,341	7.80	9.95	5.18	6.61
Pacific madrone	12	22	67	329	939	1.50	1.40	3.05	2.85
Tanoak	14	48	143	1,711	6,309	3.56	4.41	2.98	3.68
Other hardwoods	15	28	98	790	3,688	2.82	3.76	3.50	4.67
All types	135	661	2,731	18,182	88,654	2.75	3.25	4.13	4.88

^{1/} Scribner rule.

^{2/} Species listed composes a plurality of the stand.

TABLE

Volume of softwoods and hardwoods, annual softwood growth, 1987 projected softwood volume, softwood growth percent, and % softwood stocking by volume; by basin and timber type; average per acre values for Santa Cruz County, 1977.

* Derived from Pillsbury, 1979.

BASIN	TIMBER TYPE	Softwoods Volume*	Hardwoods Volume*	Total Volume*	Annual Softwood Growth*	Projected Softwood Volume*	Softwood Growth Percent	% Softwood Stocking By Volume
		1977 ft ³ /ac	1977 ft ³ /ac	1977 ft ³ /ac	PAG ¹ ft ³ /ac/yr	1987 ft ³ /ac	1977	1977
North Coast	Combined	3701	2010	5711	92.1	4622	2.49	65
	Conifer	4931	1061	5992	122.2	6153	2.48	82
	Mixed Evergreen	1938	3367	5305	48.9	2427	2.52	37
San Lorenzo	Combined	3243	2154	5397	64.6	3889	1.99	60
	Conifer	6801	1069	6870	114.7	6948	1.98	84
	Mixed Evergreen	785	3196	3981	16.2	947	2.06	20
Aptos-Soquel	Combined	4093	2319	6412	102.3	5114	2.50	64
	Conifer	8137	1407	9544	205.0	10187	2.52	85
	Mixed Evergreen	822	3056	3878	19.3	1015	2.35	21
Pajaro	Combined	1957	1853	3810	53.3	2490	2.72	51
	Conifer	5916	1047	6963	165.9	7575	2.80	85
	Mixed Evergreen	528	2143	2671	12.5	653	2.37	20
Total County	Combined	3386	2113	5499	77.4	4160	2.29	62
	Conifer	5920	1124	7044	135.2	7272	2.28	84
	Mixed Evergreen	1001	3044	4045	23.2	1233	2.32	25

¹PAG = Periodic annual growth in volume per acre per year.

FUTURE SCENARIOS OF PRODUCTIVITY

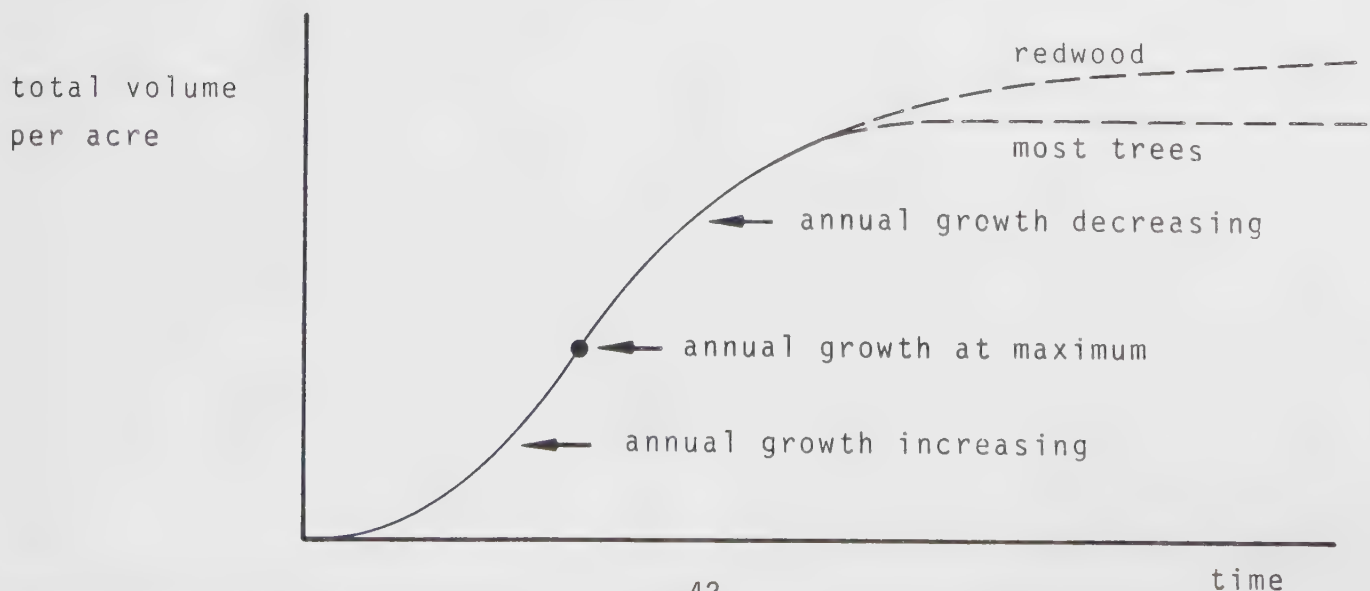
Countywide

The redwood-dominated, second growth forests of Santa Cruz County are not intensively managed. Present day stand structure, composition, and volume are a result of more-or-less natural events following clearcutting and burning which occurred around the turn of the century. (Average year of stand inception is 1904.) Although present State forest practice rules for the southern sub-district of the coast forest district (which covers the Santa Cruz Mountains) demand the use of the selection silvicultural system (which will ultimately create several-aged stands), the present stand condition countywide is substantially even-aged. Thus, some concepts normally applicable to the management of even-aged stands are helpful to characterize and analyze present stand condition and trends in Santa Cruz County.

Santa Cruz County's present even age stands have developed, like any even-age stand, according to the following curve. The vertical axis represents standing volume per acre and the horizontal axis represents time since stand inception.

Immediately after clearcutting, volume is zero and time is zero. During the younger years of the stand's life, volume increases at an increasing rate, and the slope of the curve increases. At a certain point, standing volume continues to increase, but begins to do so at a decreasing rate, and the slope of the curve begins to decrease. Ultimately, the curve of standing volume flattens out, or nearly so. [Redwood, unlike most species, continues to grow until an advanced age. (Lindquist and Palley, 1967)]

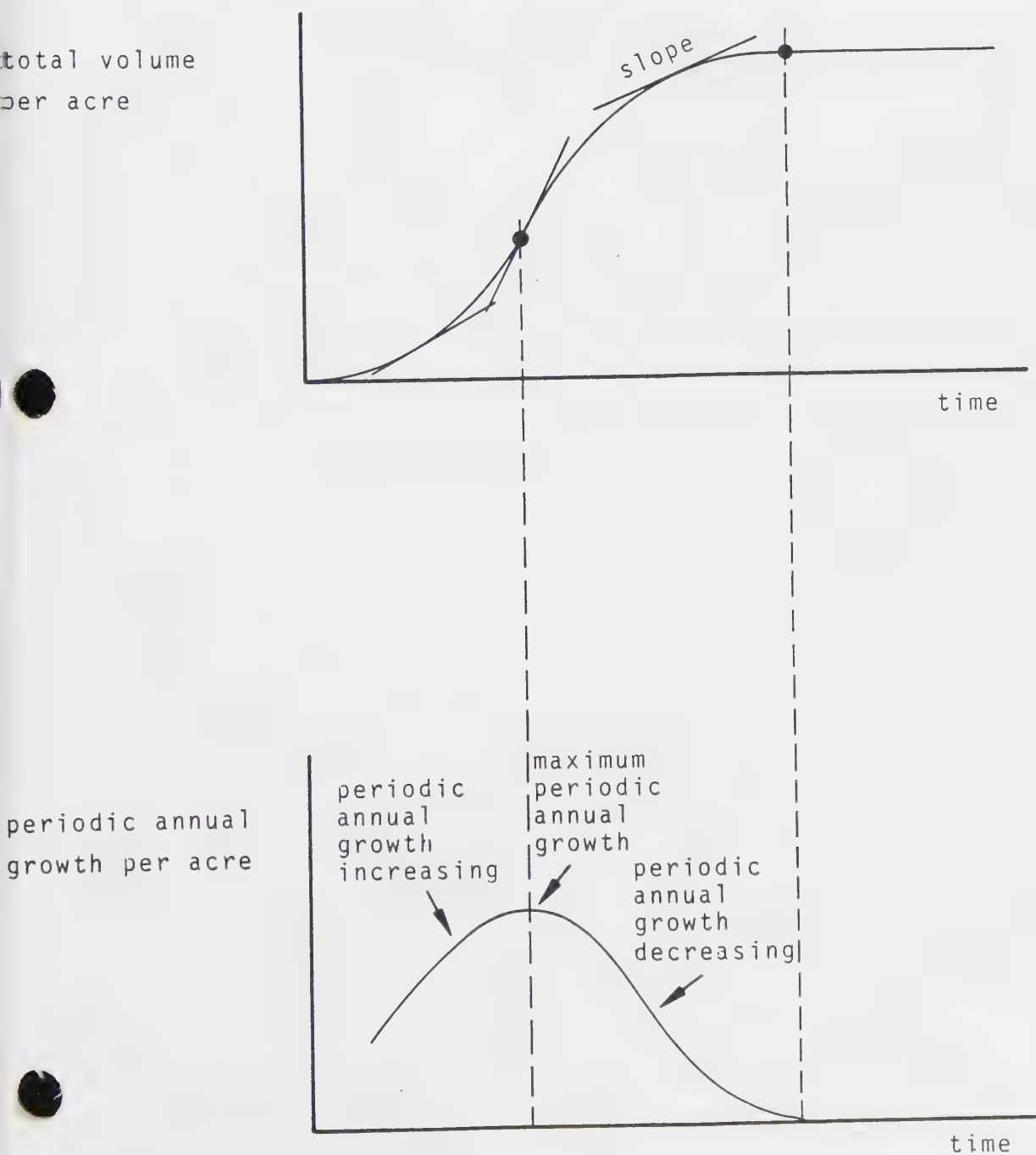
FIGURE 4
TOTAL VOLUME PER ACRE OVER TIME



From the graph of total volume per acre, it is easy to generate a curve representing annual growth per acre, termed periodic annual growth (PAG)-the growth in a given year. The PAG curve shows the slope of the total volume curve at each point on that curve, that is, for each annual period.

FIGURE 5

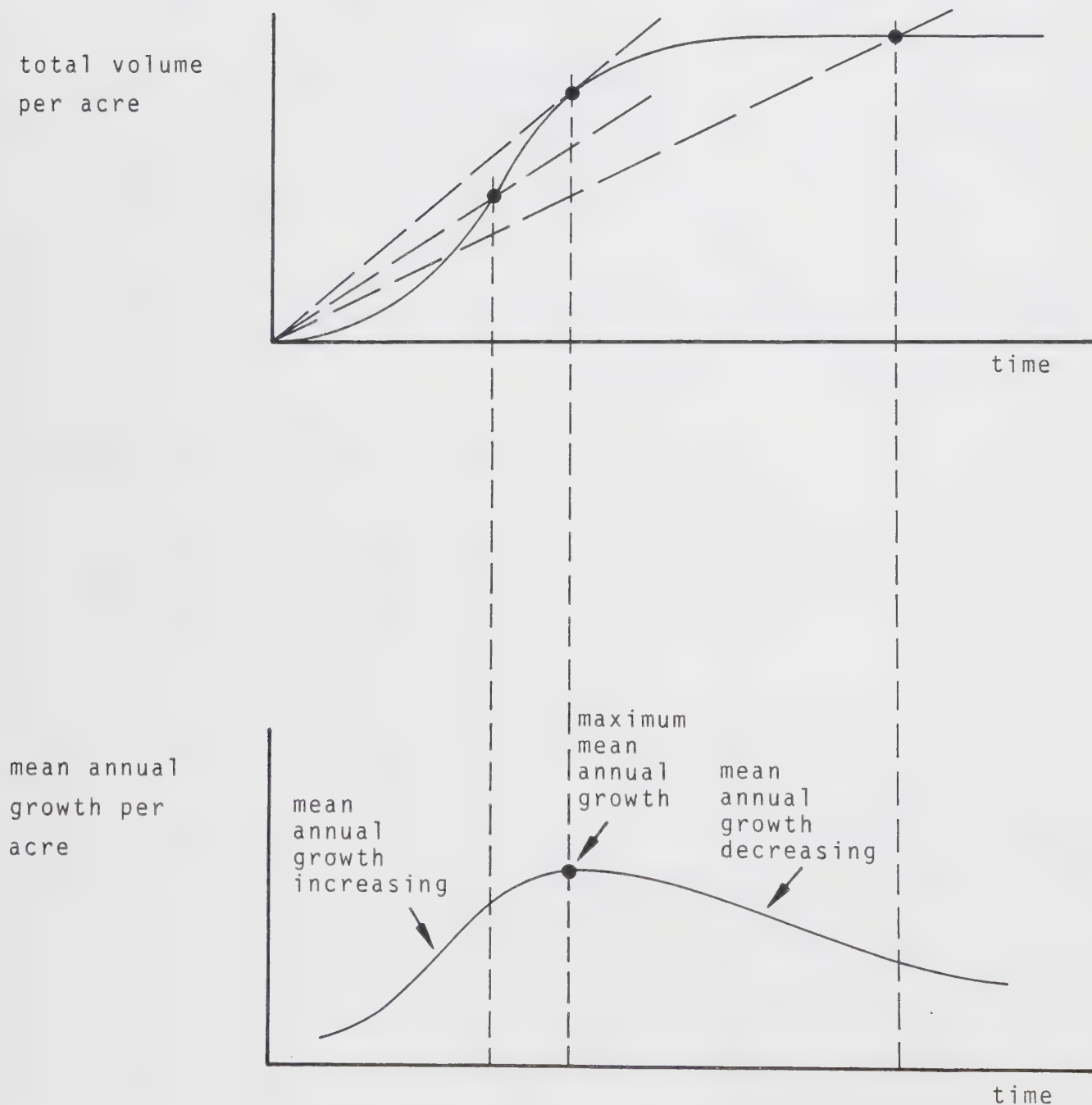
TOTAL VOLUME PER ACRE OVER TIME AND PERIOD ANNUAL GROWTH PER ACRE OVER TIME COMPARED



Another curve which can be derived from the volume curve is mean annual growth (MAG), which is the average annual growth of the stand for each year since inception until the present.

FIGURE 6

TOTAL VOLUME PER ACRE OVER TIME AND MEAN
ANNUAL GROWTH OVER TIME COMPARED



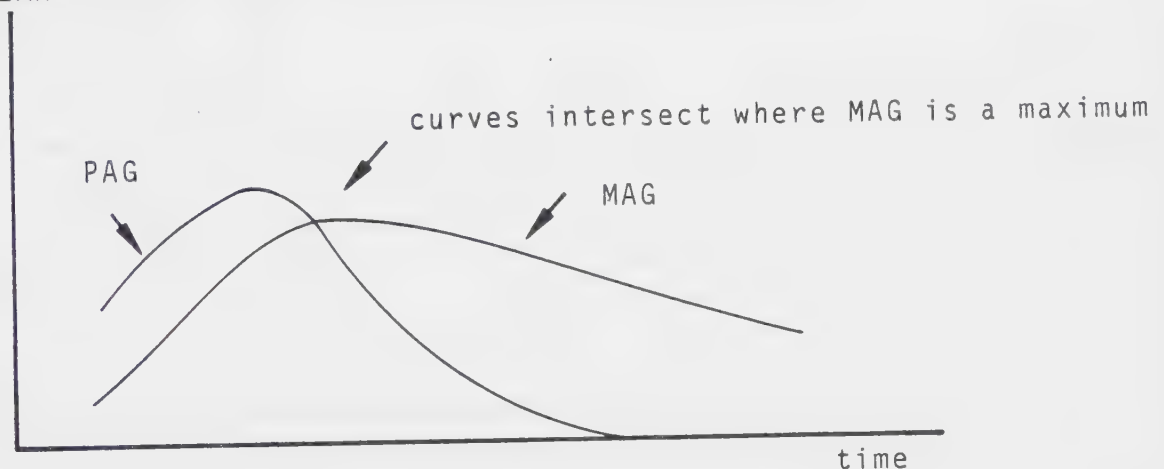
If the curve for PAG is superimposed on the curve for MAG (see Figure 7), it is always the case that:

1. PAG reaches a maximum at an earlier age than MAG.
2. PAG is greater than MAG at the points where each reaches its maximum.
3. PAG and MAG intersect where MAG reaches a maximum. (Davis, 1966)

FIGURE 7

PERIOD ANNUAL GROWTH PER ACRE OVER TIME AND
MEAN ANNUAL GROWTH PER ACRE OVER TIME COMPARED

period annual
growth per acre
and mean annual
growth per acre



Up to this point, we have simply been discussing the theoretical development of an even-age stand of any species of tree. The exact shape of the volume curve for a particular stand, or for all the stands in the County, and the curve's relationship to the "x" and "y" axes, could be determined by a series of empirical measurements over time which record the volume increase of the stand as it grows. Unfortunately, such a record has not been kept over time since 1904, but using our knowledge of the theoretical relationship between the PAG and MAG curves, and the known data points for 1973, certain inferences can be made.

The annual growing stock growth in 1972 for softwoods on 135,000 acres of commercial forest land in Santa Cruz County was 15,150,000 cubic feet. Standing volume of growing stock at the same time (the sum of growth in all previous years of the stand's life) was 561,000,000 cubic feet. (Oswald, 1979) Average stand age countywide at that time was 68 years. (Pillsbury, 1979) Therefore,

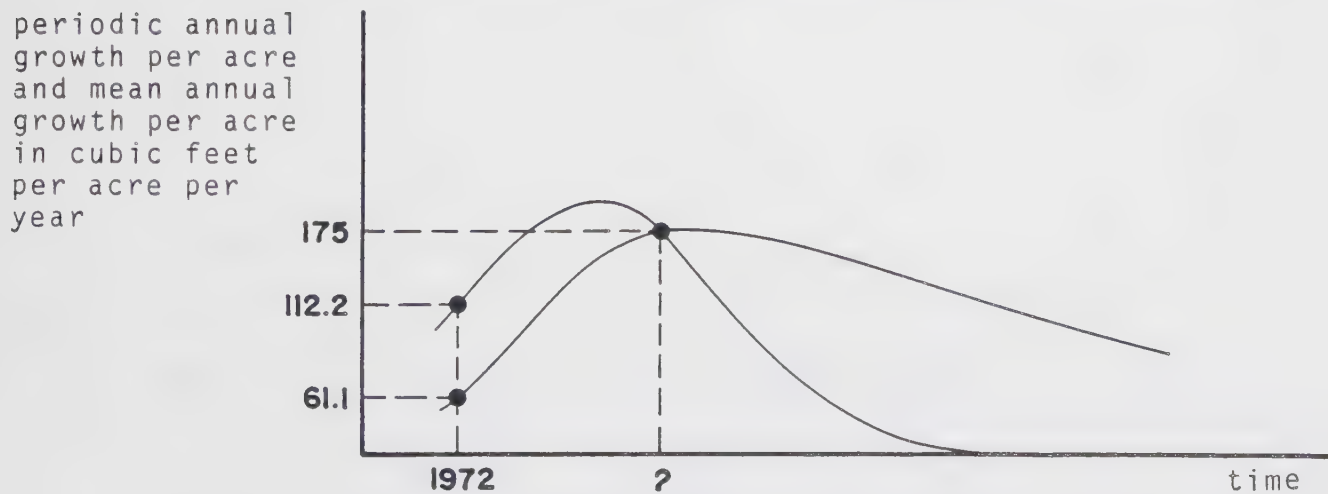
$$\text{PAG} = 15,150,000 \text{ cubic feet} / 135,000 \text{ acres} = 112.2 \text{ cubic feet per acre per year.}$$

$$\text{MAG} = 561,000,000 \text{ cubic feet} / 68 \text{ years} / 135,000 \text{ acres} = 61.1 \text{ cubic feet per acre per year.}$$

Knowing PAG and MAG for a particular year (1972) and having an estimate of 175 cubic feet per acre per year (Oswald, 1979) for PAG and MAG at the point they intersect (where MAG reaches a maximum), certain inferences can be made about the even age stand of Santa Cruz County by placing these data on the theoretical curves just derived.

FIGURE 8

CURVES FROM FIGURE 7 WITH TWO EMPIRICAL DATA POINTS AND ONE ESTIMATED DATA POINT ADDED FOR COMPARISON*



*Curves and axes are only theoretical and not drawn to scale. Shape of curves is approximate. The intent is to relate, in general terms, growth in 1972 to the estimated potential.

From Figure 8 one can conclude that:

- o Since PAG was greater than MAG in 1972, they must have been to the left of the point where MAG and PAG intersect; therefore, MAG must be increasing.
- o Since PAG in 1972 is less than the estimated value of PAG and MAG at their intersection, PAG must be increasing.

Recognizing that this analysis has used a minimum of empirical data and that several theoretical assumptions preclude producing a hard numerical answer still, a broad characterization of the yield and growth of the Santa Cruz forest can be developed.

- o It is a stand which is young and vigorous in the sense that annual growth, both periodic and mean, is increasing.
- o It is a stand which is not very close to producing at its estimated potential.
- o It is a poorly known stand about which we have scanty empirical data. We need more empirical data over time, and we need theoretical models presuming ultimate conversion of the stand to a several aged condition.

Stand by Stand

As stated earlier, second growth forests in Santa Cruz County today generally exhibit a relatively even-aged structure, dominant stems having originated in most cases immediately following clearcutting and burning.

Present state cutting rules provide constraints within which the forester and landowner are free to structure the post-harvest stand. In effect, constraints are these:

1. no less than 10 years between harvests, i.e., minimum cutting interval of 10 years
2. removal of no conifer stems less than 12" in diameter
3. removal of no more than 50% of conifer stems 12"-18" in diameter

4. removal of no more than 50% of conifer stems 18" in diameter or greater (60% if stand has not been logged since 1960)
5. reduction of basal area total (cross-sectional area of remaining stems at breast height) to no less than:

120 square feet per acre on Site I timberland

100 square feet per acre on Site II timberland

75 square feet per acre on Site III timberland

50 square feet per acre on Site IV and V timberland

These rules provide for a minimum cutting cycle, minimum residual stocking, and minimum residual numbers of stems in several diameter classes. The latter has the effect of establishing a minimum of three age classes, and therefore a minimum 30 year rotation. The forester is free to specify a longer cutting cycle, retain a greater number of stems in each diameter class, establish additional diameter classes, and carry heavier basal area stocking.

In practice, one or the other of two general approaches is usually chosen. Each approach deals somewhat differently with densely stocked and sparsely stocked stands.

1. Light cut in densely stocked stands

Clumps thinned lightly to moderately; basal area, hence growth, of residual remains high; regeneration diameter class (new sprouts) may be sparse - even-age condition maintained.

2. Heavy cut in densely stocked stands

Clumps thinned moderately to heavily; basal area substantially reduced, sacrificing short-term per acre growth; regeneration strongly encouraged; a step toward all-age structure.

3. Light cut in sparsely stocked stands

Clumps are thinned lightly to avoid dropping below the basal area minimum. Regeneration is stimulated better than when clumps are dense. Intervening hardwoods may also be benefited.

4. Heavy cut in sparsely stocked stands

Clumps are thinned moderately to heavily but intervening hardwoods are cut and conifer seedlings are planted.

Summary of Benefits and Costs Generated by Light and Heavy Cutting

Light Cuts

1. Benefits

- a. Higher value fiber growth on existing large stems
- b. Maintenance of dense canopy has certain aesthetic values and large trees have greater aesthetic value
- c. High inventory allows for liquidation if cash flow needed.
- d. Steady cash flow

2. Costs

- a. Poor regeneration - maintains even-age structure
- b. High inventory means high risk, much cash tied up
- c. Growth may be distributed too widely, slow diameter growth

Heavy Cuts

1. Benefits

- a. High diameter growth
- b. Little investment in maintenance of growing stock
- c. Good sprout regeneration - selection system works

2. Costs

- a. Sacrifice volume growth
- b. Aesthetics may be compromised
- c. Stand has relatively lower immediate cash value between cuts

Overall Summary

Countywide, growth is increasing and conifer dominance is increasing within a forest that is already growing fairly well and is well stocked with conifers. After harvest, growth is decreased as stocking of clumps is reduced, but increased by the creation of a vigorously growing young age class. Net growth of each clump is maintained.

Natural regeneration is slowly (or not at all) filling in conifers between clumps. As hardwoods die, conifers will become increasingly dominant. Future increases in conifer timber production depend upon encouragement or augmentation of this natural trend.

Oswald (1979) estimated that PAG would intersect and equal MAG at about 175 cubic feet per acre per year. This provides a convenient theoretical biologic maximum. In very broad terms, the average Santa Cruz acre has produced a stand over a generous rotation since 1904 which is about one third of what it biologically could be; production for the current year, however, is about two thirds what it could average over the long run. Increased future redwood growth depends upon an increase in the number of future redwood clumps on those acres where redwood already occurs. Other conifer species may well be more appropriate and productive on acres not presently supporting redwood.

CHAPTER IV

EXISTING REGULATORY FRAMEWORK

Regulation of timber harvesting and timberland management has undergone considerable change over the years. Public awareness has risen regarding the need to protect timberland as a valuable economic base. Likewise, the need for more careful harvesting techniques to protect environmental resources has also increased.

State and County residents have evolved in an attempt to deal with both of these concerns. This chapter explains the existing regulatory framework, highlighting both State and County policies and laws. The discussion is divided into two sections - Timber Harvesting Regulations and Timberland Planning.

TIMBER HARVESTING REGULATIONS

Forest Practice Act of 1945

In response to concerns about unregulated timber harvesting on private lands, the County of San Mateo adopted a timber harvest ordinance in 1937. Subsequently, in 1945 the state legislature enacted the original Forest Practice Act, making California the first state to regulate the private timber industry. This legislation preempted county efforts to regulate timber cutting and silenced demands for strong federal regulations being voiced at that time.

The Forest Practice Act of 1945 established a system similar to that which exists today. Policy was set by a Board of Forestry with the advice of District Technical Advisory Committees (DTAC's), both bodies were composed mainly of representatives of the timber industry and timberland owners. Their primary responsibility was adoption of Forest Practice Rules, which were in turn enforced by the Division of Forestry.

The Forest Practice Act of 1945 endured until 1971 when, in *Bayside Timber Company v. San Mateo County*, it was ruled unconstitutional by the California State Supreme Court. The basis for this ruling was that the law, through establishment of a Board of Forestry and DTAC's made up of industry representatives, created a condition of industry self-regulation. State regulation of timber harvesting activities was temporarily suspended until the Legislature could adopt a revised Forest Practice Act which addressed the issues raised by the Supreme Court ruling.

Santa Cruz County Timber Harvest Ordinance

Local concern about the social and environmental impacts of unregulated logging led the Santa Cruz County Board of Supervisors to adopt a Timber Harvest Ordinance in 1971, shortly after the Forest Practice Act was ruled unconstitutional. The policies and standards within the ordinance were the result of achieving a balance between industry needs and local concerns about public health and safety and environmental protection.

Under the County Timber Harvest Ordinance permit applications were subject to environmental review to ensure that they complied with the California Environmental Quality Act (CEQA). The environmental review process assured that timber harvest proposals were analyzed in the context of varied environmental concerns. As well, it allowed the public an opportunity to be actively involved in the evaluative process.

Public participation played an important role as well in other aspects of the County's timber harvest review process. Permit applications for large or controversial timber harvests resulted in public hearings before Planning Commission and/or the Board of Supervisors. Because of the flexibility that the ordinance afforded decision-makers, timber harvest proposals could be significantly altered to address valid public concerns raised during public hearings - an important factor in a county where logging takes place within or adjacent to urban areas.

The Timber Harvest Ordinance contained specifications for silvicultural and harvesting practices, water quality protection, road and landing construction and maintenance, erosion control methods, and fire hazard reduction. These standards were adjusted to fit the unique characteristics of a given site using the expertise of the County Registered Professional Forester, Geologist, Watershed staff, and decision makers relying upon input received through the public hearing process.

To ensure compliance with approved permit conditions, the County maintained authority through this ordinance to require sureties from the timber operator and/or the timberland owner. If a violation was not corrected within a reasonable time period, the County could correct the violation and charge all reasonable costs against these sureties.

The Z'Berg-Nejedly Forest Practice Act of 1973

In 1973, following two years of debate and lobbying, the California State Legislature adopted the Z'Berg-Nejedly Forest Practice Act. The Act was incorporated into the Public Resources Code with the intention of correcting the deficiencies in the previous law and providing the statutory authority for regulating timber harvesting on non-federal lands within the state.

This new Forest Practice Act, like the older legislation, created a Board of Forestry and DTAC's for the purpose of formulating Forest Practice Rules. The legislation also established general guidelines for timber harvest plan review and specified areas of concern to be addressed by rules to be adopted by the Board of Forestry. As under the Forest Practice Act of 1945, the new act delegates authority for plan review and enforcement of Forest Practice Rules to the California Department of Forestry (CDF).

Unlike the previous Board and DTACs, the new Board of Forestry and DTAC's each consist of nine members, including five public, three forest industry, and one range and livestock representative. The Board of Forestry, with recommendations from the DTAC's, establishes Forest Practice Rules for the Coast, Northern, and Southern Forest Districts. These three districts each

have different regulations regarding logging practices due to differences in their forest resources. In addition, subdistricts have been created which have more stringent rules than the main districts. Santa Cruz County is located within one of these, the Southern Subdistrict of the Coast Forest District.

The Z'Berg-Nejedly Forest Practice Act did not preempt individual counties from regulating timber harvesting within their jurisdictions. Therefore, the County of Santa Cruz elected to maintain its regulatory authority over timber harvesting through continued enforcement of the Timber Harvest Ordinance. For a period of 10 years timber harvest operations were regulated by both the State and the County of Santa Cruz.

Senate Bill 856

Senate Bill 856, passed into law in 1982, became effective on January 1, 1983. Under its terms, the County of Santa Cruz lost its authority to regulate timber harvesting as of July 1, 1983. The passage of SB 856 has substantially weakened the ability of the County to insure that timber harvesting operations are carried out in an environmentally sensitive manner, and in a way that takes account of the neighborhood problems that may be occasioned by harvesting. In addition, the County cannot now effectively serve as a "mediator" between timber harvest operators and affected residents, as it did under its own regulatory system. The County government has also lost the ability to set minimum standards for harvests in Santa Cruz County, and as a matter of financial feasibility, can no longer maintain a forestry professional on staff. The County believes that the long-term effect of SB 856 will be detrimental to the overall policy goals of the County, and will be detrimental to the timber industry as well.

While SB 856 ended the direct authority of counties to regulate timber harvesting, it did contain a provision whereby individual counties could request the State Board of Forestry to adopt additional rules for the conduct of timber harvesting operations, to take account of local needs. The law states that the State Board of Forestry shall adopt such additional rules and regulations if it finds that they are necessary to protect the special needs and conditions of the requesting county.

Actual experience has been that the Board of Forestry often refuses to enact rules desired by the counties, finding no need for them. The direct displacement of county authority over timber harvesting operations, thus, has not been effectively mitigated by adoption of county requested rules by the State Board of Forestry, pursuant to the provisions of Senate Bill 856.

Again, the county believes that the long-term effect will be detrimental to the timber industry, as well to the county's policy goals.

Forest Practice Rules

The Board of Forestry, with statutory authority provided by the Forest Practice Act, has adopted numerous Forest Practice Rules for incorporation into the California Administrative Code. These rules include required contents and guidelines for review of timber harvest plans, and standards for silvicultural systems, erosion control methods, road and landing construction and maintenance, and watercourse and lake protection. Contents of timber harvest plans and the State review process will be discussed in the next section. What follows is a brief discussion of the general rule categories listed above.

Silvicultural Systems

The Forest Practice Rules specify special harvesting methods for the Southern subdistrict, in which Santa Cruz County is located. The selection system of silviculture to be used in this area specifies that a maximum of 60 percent of the trees 18 inches or greater in diameter may be cut. A maximum of 50 percent of the trees ranging in size from 12 inches to 18 inches in diameter may be taken. All uncut trees must be healthy and left evenly distributed. Timber operations, once completed, may not be repeated within the same harvest boundaries for a period of 10 years.

Erosion Control Methods

Rules governing erosion control methods have been adopted to minimize soil loss and degradation of water quality. These rules apply to the manner in which trees can be felled in the vicinity of watercourses and lakes, placement of tractor roads, use of tractors on steep slopes, spacing of waterbars on roads, conduct of timber harvest operations during the winter period, and watercourse crossings.

The California Department of Forestry has developed a Soil Erosion Hazard Rating System calculated from factors such as soil permeability and texture, depth to bedrock, the amount of protective vegetative cover remaining after harvest operations, slope, and expected rainfall intensity. Based on the Erosion Hazard Rating, erosion control measures, such as spacing of waterbars or the steepness of slopes upon which tractors are allowed to operate, may be adjusted to provide varying degrees of protection.

Road and Landing Construction

This category of rules includes provisions to plan, construct, and maintain logging roads and landings in a manner which will adequately protect timber, water, soil, fish, and wildlife resources. Construction standards such as balancing cut and fill material and compacting fill material in one foot lifts are specified. In addition, the rules define the winter period deadline for installation of road drainage facilities.

Watercourse and Lake Protection

The degree of protection afforded watercourses and lakes is dependent upon the beneficial use which they have been assigned and the adjacent slope steepness:

Class I Watercourses are defined as those used as a domestic water supply within 100 feet of the timber harvest boundary or which provide year-round or seasonal fish habitat, including migration routes and spawning areas. Protection, depending on the steepness of adjacent slopes, consists of a 50 to 200 foot (slope distance) wide strip where tractors are not allowed to operate. Trees may be felled within the zone and winched to a tractor, however.

Class II Watercourses are those within 1,000 feet of a stream segment which contains fish year-round or seasonally, or which provide aquatic habitat to non-fish aquatic species. The width of the protective strip for Class II Watercourses ranges from 50 to 150 feet (measured along the slope).

Class III Watercourses contain no aquatic life but show evidence of ability to transport sediment downstream to Class I or II waters. The width of the watercourse and lake protection zone for Class III waters is unspecified and is determined from on-site field inspections.

Depending on the watercourse and lake classification, 50 percent of the understory vegetation and/or 50 percent of the overstory vegetation present before timber harvest operations must left standing and well distributed.

Forest Practice Rules as "Best Management Practices"

As part of its responsibilities under the Federal Water Pollution Control Act, the state Water Resources Control Board (SWRCB) is charged with certifying various State regulatory programs for consistency with the Act. As part of this certification process, Board of Forestry staff prepared a "208 Report" in 1979 which identified numerous deficiencies in the Forest Practice Rules

pertaining to the protection of water quality and made suggestions for improvements in the rules.

The SWRCB subsequently contracted with the Board of Forestry to review and revise the Forest Practice Rules to insure compliance with the Federal Water Pollution Control Act and to incorporate recommendations for improvements contained in the "208 Report". These revisions, which included changes to provisions for watercourse and lake protection, road and landing construction, erosion control, and the review process were incorporated into the Forest Practice Rules in October, 1983. On June 21, 1984 the SWRCB certified the revised Forest Practice Rules as "Best Management Practices" for an interim four year period. Final certification will be based upon the results of a state-wide monitoring program to determine the effectiveness of the Forest Practice Rules for protecting water quality.

State Review Process

Procedures for reviewing timber harvest proposals for adequacy were established by the Forest Practice Act and through rules adopted by the Board of Forestry. This review process was declared the functional equivalent to an Environmental Impact Report by the State Resources Agency Director in early 1975. The review process, through this ruling, was determined to be in conformance with requirements of the California Environmental Quality Act. (In other words, no actual environmental review, per se, is required for individual harvest plans.)

Timber harvest plans are prepared by Registered Professional Foresters and submitted to CDF for consideration. Timber harvest permits are issued without charge to the applicant. Plans are submitted on standardized forms provided by CDF and include a description of the harvest area and information concerning anticipated commencement and completion dates, types of forest products to be harvested, types of yarding systems to be used, intention to log during the winter period, presence of rare, endangered, or unique plant or animal species, road and landing construction, watercourse and lake protection, and the Erosion Hazard Rating calculated for the site. Any practices applied in-lieu of those specified in the rules must be explained and justified in the timber harvest plan. A timber harvest plan also includes a map indicating the location of roads, skid trails, landings, watercourses, watercourse crossings, and areas of known geologic instability. Areas to be harvested through use of different yarding systems are also mapped.

When preparing a timber harvest plan, a Registered Professional Forester must consider a range of alternative operating methods and procedures which will result in acceptable economic benefits while providing a high degree of

environmental protection. This feasibility analysis is intended to facilitate preparation of a plan which balances economic and environmental concerns and to provide information to decision makers for consideration during the review process.

Timing of Review

The Forest Practice Act specifies that the review period for timber harvest proposals will be 35 calendar days (see figure 9).

Figure 9
Timing of State Review Process

CDF Plan Receipt	Last Day for Plan Filing	Last Day for Preharvest Inspection	Director's Decision
0	10	20	35

Upon receipt of a timber harvest proposal CDF has 10 calendar days in which to review the application to ensure that it is complete. The plan is officially filed in the local and regional offices following this determination. Within 10 days of the filing date CDF conducts an initial or preharvest inspection to determine the suitability of measures proposal in the plan in relation to conditions found on the site. Alterations in the plan may be made to the plan at this time. Within 15 days of the preharvest inspection an interdisciplinary Review Team meeting and a public hearing, if requested, is held. At the end of this 15 day period CDF must take action on the plan.

Review Team

The purpose of the Review Team is to provide for interdisciplinary review of timber harvest plans. The Review Team, chaired by CDF personnel, consists of a representative from the Department of Fish and Game, the Regional Water Quality Control Board, the local publicly owned water purveyor, the County of Santa Cruz, and when necessary, the Coastal Commission and State Parks Department. In addition, a representative from the California Division of Mines and Geology may attend and provide geologic review if requested by CDF or members of the Review Team. The timing of the Review Team meeting is not specified by the rules but is scheduled by CDF. The meeting generally occurs within 10 days of the decision date.

In evaluating a plan, the Review Team conducts its own feasibility analysis of the proposed operation which considers the economic and environmental implications of alternative timber harvesting methods. The Review Team meetings consist of office and field review of timber harvest plans. The Review Team may elect to forego a site investigation if, through office review of the plan, it is determined that timber harvest operations will minimally impact the environment. Members of the public may attend the office portion of Review Team meetings, but must obtain property owner permission in order to accompany the Review Team on its site visit.

Review Team members may request additional information beyond that contained in the plan if such information is crucial in formulating recommendations. Such a request must be approved by CDF. If the request for additional information will require an extension of the review period, the applicant must grant permission for the time extension beyond the 35 days specified in the Forest Practice Act.

The Review Team serves in an advisory capacity to CDF in making recommendations on timber harvest proposals. The Review Team Chairperson is responsible for finalizing recommendations on a plan for consideration by the Regional Resource Manager (Director) and may choose to delete Review Team concerns if he or she does not consider them appropriate.

If a member of the Review Team does not concur with the chairpersons recommendations to the Director, the member may submit a "nonconcurrency" form within five days of the Review Team meeting. The written nonconcurrency must state the specific reasons why the recommendations do not provide adequate protection for the resources on or near the proposed timber harvest site. If such a nonconcurrency is filed, the Review Team chairperson must prepare a written response for the Director explaining how the concerns cited have been addressed in the plan.

Public Input

In Santa Cruz County copies of the Notice of Intent to Harvest Timber are sent to all property owners within 300 feet of the property boundaries upon which a plan has been submitted and owners of property fronting or bordering on that portion of the haul route lying between the plan area and the nearest public road. Members of the Board of Supervisors in whose district the harvest is proposed, the local school district, and the publicly owned water district which maintains water production or storage facilities in the watershed are also notified.

The County of Santa Cruz has the ability to request public hearings on timber harvest plans if such a request is made within seven calendar days of plan receipt. Due to the difficulty of visiting the proposed timber harvest site and gauging public concern within the seven day limit, such requests are routine. Public hearings on timber harvest applications in Santa Cruz County are held subsequent to the Review Team meeting and prior to the decision date. As the Forest Practice Act does not specify timing, CDF sets the dates for public hearings. During the public hearing, which is chaired by CDF personnel, the timber harvest proposal is presented along with any changes which may have been made during either the preharvest inspection or the Review Team meeting. Public testimony is taken and if significant issues are raised, a written response is required to be prepared by the CDF employee responsible for approval or disapproval of the plan. This response is required to be made available to the public and to Review Team members prior to final action on the plan.

Directors Determination

Within 35 days of plan receipt the Director determines whether a timber harvest proposal should be approved, disapproved, or referred to the Board of Forestry for their consideration.

Plan disapproval may occur only after the Director has made findings that specific conditions exist. These findings include:

- a) Boundaries of the area to be harvested are not clearly delineated on the plan.
- b) Public acquisition of the parcel for purposes which would be impaired by timber harvesting is legislatively authorized, funded and imminent.
- c) There is evidence that the information contained in the plan is incorrect, incomplete or misleading in a material way.
- d) Implementation of the plan as proposed would irreparably damage plant or wildlife species listed as rare or endangered by the Department of Fish and Game.

The Director may refer a timber harvest plan to the Board of forestry for their consideration if he or she determines that there exists a substantial question concerning the intent of the Forest Practice Act which is not currently provided for by the Forest Practice Rules and that the plan, if approved, could result in immediate, significant, and long term harm to the natural resources of the State.

Appeals to the Board of Forestry on the Director's Determination can be undertaken by the applicant only. Such an appeal automatically results in a hearing before the entire Board of Forestry, who decide whether the applicants' concerns have merit. (AB 3838, which became effective on January 1, 1985, gives the County limited appeal rights.)

TIMBERLAND PLANNING

For a number of years the concept of formal planning for smaller privately-held timberlands was virtually non-existent. Starting in the mid 1970's, however, several new concepts were formulated at both the State and County levels which have brought about an integrated timberland management framework. There are, of course, some problems with these systems, but the existing framework, with some modification, could be a very effective tool for protection and proper management of timberlands.

Possible changes to these policies are discussed in Chapter VII - "Impacts and Issues". For the purposes of this chapter, the discussion has been focused on State TPZ regulations, County TPZ regulations, TPZ legal precedents, and other County timber planning policies.

State Regulations - Forest Taxation Reform Act

Prior to 1974 timber and timberlands were taxed under the property tax system. Based upon the County Assessor's determination of fair market value, this tax was often based upon a "highest and best use" of the property which was commonly not timber production. As a result there was often financial pressure placed upon the landowner to convert the timberland to residential or other uses.

In 1974 the voters approved Proposition 8 which amended the Constitution to allow the legislature to develop a new system of forest taxation based on factors other than property valuation. In response to the passage of Proposition 8 the Legislature adopted the Forest Taxation Reform Act, (FTRA) in 1976.

The Forest Taxation Reform Act provides for restrictive zoning of timber-producing land by creating a statewide zoning designation of Timberland Production Zone (TPZ). Land so zoned is restricted to the growing and harvesting of timber and County adopted compatible uses. Taxation of property designated as TPZ assumes that timberland is the highest and best use of the land. Once harvesting takes place, a special tax is levied on the volume of timber removed. This tax is intended to replace revenues lost through lower property tax assessments.

In order to determine which parcels were to be placed in TPZ, procedures and criteria were adopted for timberland zoning. The FTRA required that all parcels which were at the time assessed for growing and harvesting timber and parcels that met the criteria for this zone district, but were not previously assessed for growing and harvesting timber, be considered for TP zoning.

These parcels were assembled into three groupings known as the "A", "B", and "C" lists. The "A" list was to include all parcels assessed for growing and harvesting timber prior to 1976. No properties in Santa Cruz County met this criterion.

The "B" list was to include all parcels which met the definition of Timberland specified in the Act, as determined by the County Assessor. In all but a few cases, lands currently designated TPZ in Santa Cruz County were so designated through the "B" list process. Unfortunately, many parcels suitable for timberland zoning were not designated on the "B" list by the County Assessor, and so remain in non-TP zoning designations at this time. Zoning to TPZ through the process established by the FTRA required Planning Commission and Board of Supervisors public hearings, and a 3/5 vote of the Board. The Legislature established that this zoning take place by February 21, 1978, and that it be a one-time opportunity.

The "C" list allows for an ongoing process through which property owners not included on the "A" or "B" list may be considered for TP zoning. To qualify for TPZ through this process, the property owner must show that the property meets the definition of timberland, contains no incompatible uses, and meets required timber stocking requirements.

Definition of Timberland

Parcels included in the Timber Production Zone were required to meet the State definition of timberland. For the purposes of the FTRA, timberland is defined as:

"privately owned land, or land acquired for State forest purposes, which is devoted to and used for growing and harvesting timber and compatible uses, and which is capable of growing an average annual volume of wood fiber of at least 15 cubic feet per acre per year."

Definition of Compatible Uses

Another significant concept presented in the FTRA is that of compatible uses. This definition delineates which land uses are allowed on TPZ lands thereby assuring that activities do not conflict with timber production. These uses include watershed and wildlife management, timber production, maintenance of public facilities and grazing.

In addition, Santa Cruz County has adopted a list of other uses which are either permitted in TPZ (no special review required) or conditionally permitted (special review and approval required). These will be discussed later in this Chapter.

Rezoning Out of TPZ

If a timberland owner desires to rezone a parcel from Timberland Production Zone he/she may take one of two routes - either normal or immediate rezoning. A normal rezoning requires an owner to apply to the County for rezoning to some other zone district. The Board of Supervisors rules on the request after a public hearing is held. If the request is approved by the majority of the full Board, the new zoning becomes effective ten years from the date of approval.

Immediate rezoning from TPZ (which is more commonly requested) is to allow land to be rezoned immediately to some other zone district. County approval must be supported by a four-fifths majority of the Board, and must include the following special findings:

1. The immediate rezoning would be in the public interest; and
2. The immediate rezoning does not have a substantial and unmitigated adverse effect upon the continued timber-growing use or open-space use of other land zoned as timberland preserve and situated within one mile of the exterior boundary of the land upon which immediate rezoning is proposed;
3. The soils, slopes, and watershed conditions will be suitable for the uses proposed by the applicant if the immediate rezoning is approved;
4. The immediate rezoning is not inconsistent with the purposes of the Forest Taxation Reform Act.

For conversions greater than three acres, once County approval takes place, similar findings and approvals are required from the State Director of Forestry.

Timber Assessment - Timber Yield Tax

The FTRA specifies that all standing timber is exempt from ad valorem (yearly) taxes on its commercial value, but subject to a yield tax when it is harvested. The yield tax applies to all timber in California, including fuel wood, regardless of the zoning of the underlying land.

The timber yield tax is a local tax administered by the State Board of IEQUALIZATION (SBE). The revenue distribution and rate setting systems of the timber yield tax are very complex. The main intent, however, is to generate an annual revenue under the yield tax system which is equal to the average revenue generated by the old ad valorem tax. This tax rate is based upon the revenues generated during the tax years 1972-73, 1973-74, and 1974-75.

The yield tax rate of 6 percent was computed to guarantee 17 selected timber counties such historic revenues. In addition, a timber reserve fund tax was established to provide for a reserve where the revenues generated by the regular percentage rate are not adequate. The reserve fund rate is adjusted up or down each year to keep the amount in the reserve fund within specified limits.

Until the tax year 1983-84, Santa Cruz County did not receive any of these replacement tax revenues even though they were being collected by the State from local timber harvests. Until then, the revenues were distributed only to counties which had zoned properties TPZ through the "A list" process. Recent legislation has rectified this problem, and by the 1984-85 tax year most of the locally generated timber yield tax will be returned to the County.

County TPZ Process

The County TPZ process follows the mandates of the FTRA. In several areas, however, the County has exercised its latitude to implement these policies with local concerns and conditions in mind, particularly in the areas of determining specific criteria for designating TPZ lands and determining compatible uses beyond those specified by the State.

The FTRA required the County to adopt a Timberland Production Zone Ordinance in order to zone property for TPZ. The ordinance was adopted prior to adoption of the "B" list through a separate public hearing process.

Additional compatible uses, administered through the County's planning procedures, were designated as either permitted or conditional uses. Permitted uses, which require no special permit, include agriculture, accessory structures, and one single-family dwelling per forty acres.

The granting of a special permit is required for allowing conditional uses. In addition to the required permit, special findings are required to assure that the proposed conditional uses are consistent with the purposes of the FTRA. In addition, the proposed use must be supported by a Timber Management Plan which must be approved by the County.

The following are presently considered conditional uses:

1. Mineral production and quarry operations, in conformance with the provisions of the Mining Ordinance.
2. Erection, construction, alteration and maintenance of gas, electric, water or communications facilities.
3. Outdoor recreation, educational or religious activities, in conformance with the provisions of County Zoning Ordinance.
4. Conversion to agricultural uses not exceeding ten percent of the total of the timber area on the parcel.
5. One or more single-family dwellings, with accessory structures, at a density in conformance with the General Plan but not to exceed one dwelling unit per 40 acres (160 acres in the Coastal Zone); or if the development is clustered one unit per 10 acres (40 acres in the Coastal Zone).
6. Habitable accessory structures.
7. Temporary (not more than three years) occupancy of a mobilehome or travel trailer by a caretaker or watchman in isolated areas on a minimum of ten acres.

TPZ Court Cases

Rezoning of property to TPZ was not perceived by all property owners in a positive light. Several property owners challenged the County throughout the TP rezoning process. Two property owners carried their challenges into the courts. These cases served as very important statewide precedents for interpretation of the FTRA and implementation measures. Defense of the County's position took place from both the local and state level.

J. Hart Clinton vs. County of Santa Cruz

On December 17, 1979, J. Hart Clinton challenged the legal basis for the Board of Supervisors' decision to rezone his 85 acres of timberland to Timberland Production. The issue taken up by Superior Court was how the definition of timber and timberland found in the FTRA was to be interpreted. Judge Hall found that a prerequisite of TPZ zoning was that the lands must be in the actual practice of timber production and harvesting. He concluded that to be zoned as TPZ, the landowner must intend to actively cultivate timber

commercially, rather than inactively maintain the timber resource for potential commercial use as the FTRA language ("maintained for the eventual harvest") would imply.

The State appealed the decision of the County Superior Court as they felt that the purpose of the FTRA had not been thoroughly addressed, resulting in a misinterpretation of the timber and timberland definitions. The State argued in Appeals Court that the requirement for the active maintenance of timberlands was inaccurate, and, as stated in the Court of Appeal briefs, "would reduce an elaborate legislative structure to a pile of ashes." The appellants further argued that the broad goals of the FTRA could be effectively defeated if the present owner's intent for present and future use of the land determines the suitability for TP zoning.

Clinton further argued his interpretations of the timber and timberland definitions, suggesting that the distinction of "timber" as opposed to "forest trees" was intentional and that "forest trees have the potential to become forest products" while "timber is destined to become forest products". His argument failed to persuade the Appellate Court, and in June of 1981 it overturned Judge Hall's local ruling.

Telford, Inc. vs. County of Santa Cruz

The Appeals Court decision of J. Hart Clinton vs. County of Santa Cruz was followed in the local court's decision in Telford, Inc. vs. County of Santa Cruz. The plaintiff claimed that improper TPZ zoning of his property had taken place. Telford, Inc. alleged that an economic study should have been conducted to study the economic impacts of his land being devoted to timber production prior to rezoning to TP.

The findings in the Superior Court reflected the Court of Appeal's decision in the Clinton case, namely that the subjective motivation of the property owner is not relevant in determining whether land should be zoned as TP. Another finding in the Telford, Inc. case was that Santa Cruz County's TP zoning process was proper, and that such zoning did not result in the taking of his property because Telford, Inc. was not "deprived of all reasonable use of the property."

1 Timber (FTRA) - Trees of any species maintained for the eventual harvest for forest product purposes...

2 Timberland (FTRA) - Privately owned land or land acquired for State forest purposes which is devoted to and used for growing and harvesting timber...

Additional County Timberland Planning Policies

When parcels are designated Timber Resource on the General Plan Resources and Constraints Map, new uses on such parcels must conform with the General Plan timber policies (Chapter 2.4 of the General Plan). The following General Plan policies require special review of non-TPZ parcels containing timber resource:

- Restricting the division of large (over 20 acres) land ownerships in areas designated Timber Resources.
- Encouraging development clustering on parcels designated as Timber Resource on the General Plan Resources and Constraints Maps .
- Encourage timberland owners to apply for TPZ and/or Open Space Easements.
- Protect non-TPZ lands that are designated as Timber Resource through low density zoning.

In addition to General Plan policies, several programs in the General Plan's timber section encourage the long-term preservation of timber resources through: encouraging the development of new timber resources; preparing a countywide Timber Management Plan; researching the future use of wood as a fuel; incorporating new data and information into the Timber Harvesting Ordinance; encouraging efforts to secure Timber Preserve zoning for non-TPZ lands which are designated as Timber Resource; and updating and reviewing the County's Timber Harvest Inventory.

In summary, through the General Plan, the County recognizes that continuous careful management creates a renewable resource that benefits the entire County.

CHAPTER V

TIMBER MANAGEMENT IN SANTA CRUZ COUNTY

Santa Cruz County Timberland is comprised for the most part of small parcels. Because of this, few timberland owners are actively managing the timber resource on their properties. Fortunately, even without the benefit of active management, conifer stands continue to grow. Growth under these conditions, however, does not result in maximum production or economic return. To achieve these goals, active timberland management planning is needed.

This Chapter attempts to characterize the various timberland owners and their management goals, sets a general framework within which timberland management planning should take place, and discusses a variety of programs to assist property owners in management of their timberland.

TIMBERLAND OWNERSHIPS

Most of Santa Cruz' 135,000 acres of commercial forest land (89%) is owned by "miscellaneous" owners (Oswald, 1979). These landowners, including owners of land zoned timberland preserve, may not be actively involved in timber management for the purpose of producing timber crops. But owner intentions notwithstanding, highly productive timberland, even if totally unstocked, will eventually succeed to stands of commercial conifers which probably will ultimately be harvested. Intensification of management however, could result in producing a heavier crop sooner.

Referring to the national timberland ownership situation, the Forest Service has found that ...

"...some 278 million acres or 58 percent of the (national) total (is) in farmer and other private ownerships--a diverse group that includes housewives, doctors, lawyers, and numerous other occupations and retirees. A substantial number of these ownerships are small, some under 10 acres. At any given time many owners have management objectives that are not compatible with timber harvesting. Part of the acreage in these ownerships is in heavily populated areas. While small size, management objectives, and location may constrain the potential for managing some of the area in these ownerships as production units, and at any given time limit the area available for harvest, all of these acres grow timber. Tenures are short and objectives change as owners change. The available evidence suggests that nearly all of the timber on these ownerships sooner or later becomes available and is used for industrial wood products or fuelwood."

(USDA Forest Service, 1980)

"Miscellaneous" owners (Oswald, 1978) and "farmer and other private" owners (USDA Forest Service, 1980) are practically the same in terms of the problems associated with intensification of management for timber production. Both terms adequately characterize Santa Cruz County timberland owners. Owners in these categories generally lack investment incentive, cannot accept the level of risk involved, and lack professional forestry guidance.

"While there are many biological and economic opportunities to increase timber growth, the owners of commercial timberland determine the purposes for which the land will be used and the way in which it will be managed. There is a broad range of objectives and financial and technical capabilities among the millions of owners of commercial timberland. In addition, there are various legal and institutional constraints and incentives that affect the way in which different owners manage and use their land and timber resources. Together, these considerations determine the extent to which the opportunities to increase timber growth have been and will be realized."

(USDA Forest Service, 1980)

The silvicultural skills and technical means to intensify timber management are readily available. In many instances, funding is also available. Often, what is lacking is the perception on the part of landowners that any intensification is appropriate. Even when intensification is clearly appropriate, given a countywide and long-term perspective, it might not seem appropriate from an individual landowner's short-term perspective.

SPECTRUM OF INTENSITY OF TIMBER MANAGEMENT

No Active Timber Management

The lowest level of timber management in the county consists of no action. This type of management is encountered on all size parcels under a variety of owners. Often, timber growing and harvesting are not a part of the reason for owning the land. The forest may or may not be adequately stocked. In these cases, where timber production is not even a part of the reason for land ownership, a change in owner goals is required before timber will be more intensively managed.

Sporadic Harvesting - Low Level Timber Management

A somewhat higher level of management occurs on parcels which are occasionally or sporadically harvested. Typically these parcels are logged every now and then, usually when the property changes owners or when owners are confronted with a difficult cash flow situation. Harvest timing and intensity are governed by the landowner's demand for income.

This type of management may stimulate growth somewhat, but may also have the opposite effect if an already sparse stand is thinned too much. Thus, management of this type is more acceptable in densely stocked stands than in stands where stocking is already a problem. Many parcels in Santa Cruz County are managed at this low level of intensity. The silvicultural rules included by the State's Forest Practice Act and Regulations are designed to provide a floor below which management of these parcels will not fall.

Active Timber Management

A moderate level of timber management occurs on parcels where future stand structure and productivity are considered as a part of a timber harvest or where attempts are made to stock unstocked land. This occurs when cutting of a stand is planned with regard to both present income and future growth and when brushfields and understocked stands are planted with commercial conifers. Sometimes a formal timber management plan is a part of this management level. However, many non-foresters may possess the skills for such low-level forestry. Thus, individual landowners are often quite capable of managing their property themselves. When non-commercial operations are proposed (afforestation of presently non-stocked acres), government funding may be available.

Formal Timber Planning

This level of timber management occurs when the landowner participates in intensified timber management and attempts to achieve a high level of timber growth on his/her land. Included in this type of management is a formal timber management plan prepared by a Registered Professional Forester (RPF). Priorities in this plan should include a combination of landowner's goals, stocking control, projections of future timber growth, constraints involved and available assistance from the government.

The role of the RPF, in addition to preparing the Timber Management Plan, may also include preparation of a timber harvesting plan and acting as an agent for the landowner. In this latter role the forester may help the landowner to achieve short-run economic goals and also maximize the long-run productivity of his/her timberland.

TIMBER MANAGEMENT PLANS FOR INDIVIDUAL OWNERSHIPS

The Forest Practice Act and Regulations constitute the rudiments of a timber management plan for all properties in Santa Cruz County. It provides a floor

below which timber management cannot fall, but it does not necessarily help the highly motivated landowner derive the most from his/her timberland. Timber management planning on an individual parcel basis is a means to this latter end, and when aggregated among the more intensively managed parcels countywide, produces broad economic, environmental, and social benefits for all County residents.

Timber management plans are often prepared as a requirement under the Timberland Production Zone Ordinance. Such a plan is required when the landowner of a TPZ parcel proposes a conditional use or proposes a land division.

For the purposes of TPZ conditional uses, the County Code currently defines a Timber Management Plan as "a written plan for development and utilization of timber resources and compatible uses which assures the continued viability of the timberland, and which includes reasonable rotation and cutting cycle data."

In these instances, the motive for having a plan prepared may not be a recognition of the value of planning or a desire to intensify the level of timber management. Rather, the landowner may consider the plan to be a necessary hurdle to be jumped before obtaining the goal of a use permit or land division.

Clearly, planning undertaken in this context cannot be as productive an endeavor as when the landowner truly perceives the value of the plan and when it is prepared without government prompting. Nevertheless, both the State Act and the County TPZ Ordinance place great emphasis upon timber management planning to mitigate potential adverse consequences of both the creation of smaller parcels and non-timber use. The implication at both levels of government is that timber management planning cannot be effective and legitimate, if conditional uses and the creation of small parcels are allowed without consideration given to timber growing and harvesting.

The ideal motive for preparation of a timber management plan is that the owner has become convinced that a plan will lead to better management of his/her land. The main reasons for having a written plan are to aid the landowner in conceiving appropriate goals, organizing data, developing realistic objectives and concrete policies, and devising ways to implement them.

With these management needs in mind and recognizing other landowner goals, general guidelines for preparation of Timber Management Plans have been developed. Such a plan should be a thorough and creative document. The forester should advise and assist the landowner in the development of goals

and then propose a plan which achieves these goals in a realistic ecological, economic, and political context.

The following guidelines are proposed for timber management plans prepared in Santa Cruz County:

1. When a conditional use or minor land division on TPZ land is proposed the timber management plan must include ordinance-prescribed items and provide the County with the information needed to make the mandatory findings.
2. The timber management plan should primarily be a management plan for the timberland resource and include reference to conditional uses secondarily. It should not be a rationalization for a conditional use proposal.
3. The plan should include the option to increase conifer stocking in poorly stocked stands, pure hardwood stands, brushfields, or degraded grasslands. It should be emphasized that these areas may be capable of growing commercial timber and should be unconstrained by non-timber use.
4. The timber management plan should include reasonable rotation and cutting cycle data.
5. Given the land ownership pattern in Santa Cruz County, the transportation element of a timber management plan is highly critical in terms of the future economic viability and environmental impacts of timber production. The plan should evaluate transportation in terms of what types of transportation may be available in the future. Therefore consideration of several road layouts is an appropriate part of a timber management plan. The following are considerations that should be addressed.
 - What road system has historically been used?
 - What road system would be appropriate if the parcel were to be yarded by tractor, rubber-tired skidder, low-psi (pound per square inch) flotation equipment, or balloon (all of which generally mean downhill yarding and a road system serving landings located low on the parcel)?
 - What road system would be appropriate if the parcel were to be yarded by high-load, skyline, or helicopter (all of which generally mean uphill yarding and a road system serving landings located high on the parcel)?

- Where parcel boundaries are a constraint, what is the best road network?
- Where parcel boundaries are not a constraint and where reciprocal rights-of-way have been obtained, what is the best road network?

AVAILABLE GOVERNMENT ASSISTANCE

In order to encourage timberland planning and management, the Federal and State governments have developed a variety of programs to assist property owners in management of their private lands.

Although these programs have been seldom used in Santa Cruz County, that fact is more likely due to a lack of knowledge of the programs than their lack of potential usefulness. The description of these programs is broken into Federal Programs, State Programs, and Federal/State Programs.*

Federal Financial Assistance

Agricultural Conservation Program (ACP)

The Agricultural Conservation Program is a cost-share program of the U.S. Department of Agriculture administered by the Agricultural Stabilization and Conservation Service. Started in 1936, the program encourages conservation practices intended to stop soil erosion, to conserve water, forestry, and wildlife resources, and to resolve water quality problems.

Two forestry conservation practices are offered in Santa Cruz County through Agricultural Conservation Program Forest Tree Plantation and Forest Stand Improvement. Cost-share rates are usually 75 share benefits per year per landowner. In Santa Cruz County, in 1981, \$10,500 was allotted for three projects. The projects must be maintained for ten years or cost-shares must be returned.

* Most information in this section was obtained from the 1980 Report of the California Forest Improvement Committee.

The California Department of Forestry provides technical assistance for ACP forestry projects. The local agency to contact for further information is:

Santa Cruz County Executive Director
ASCS Office
Agricultural Business Center
635 S. Sanborn Road, Suite #6
Salinas, CA 93901 (408) 424-7377

Forestry Incentives Program (FIP)

The Forestry Incentives Program was authorized by Congress in 1973 to share tree planting and timber stand improvement costs with private landowners. This cost-share program is designed for the nonindustrial private landowner to make a long-term investment in timber production.

Eligibility for FIP cost-share assistance requires the applicant to own a tract of no more than 1,000 acres of commercial forest land, the land be capable of producing 50 cubic feet of wood per acre per year and suitable for reforestation or for improved forest management.

The cost-share rate is usually 75 percent, with the landowner earning up to \$10,000 in cost-shares per year. The agreement must be maintained for at least 10 years or the cost share must be returned.

As with ACP, FIP is administered by ASCS. The Forest Service has responsibility, to provide technical oversight for the FIP Program, and have arranged that such oversight is actually provided by the California Department of Forestry.

State Financial Assistance

California Forest Improvement Program (CFIP)

The California Forest Improvement Act was approved by the State Legislature in 1978. The goal of the Act is to improve the timber productivity of deficiently stocked forest land.

The funds available to forest landowners include cost-share payments with the state paying up to 90 percent of the costs. The program is funded from state forest timber sale receipts appropriated by the legislature. These funds are available for reforesting lands not logged since 1974 and reforesting lands in which post harvest minimum stocking is not required.

To be eligible for 80 percent of the project cost or the maximum amount approved for the project, whichever is less, the landowner must own less than 5,000 acres of forest land. If the land is not in the Timberland Preserve Zone, only ownerships greater than 20 acres are eligible for timber related practices and the landowner must agree to not develop the land for uses incompatible with forest resource management for at least ten years.

Certain stipulations allow for the 90 percent cost-share rate, including: ownership of less than 500 acres of forest land in California and ten percent of the project costs will be for forestland conservation measures or fish and wildlife habitat improvements.

In the years 1980 and 1981, Santa Cruz County has received \$206,000 to carry out twenty-five projects. The California Department of Forestry can provide further information on CFIP projects.

Chaparral Management Program (CMP)

In 1980 the Chaparral Management Program was approved by the State Legislature. The goal of the program is to manage wildland fires in state-responsibility areas through prescribed burning and reseeding with desirable plant species providing a variety of vegetation types and age classes that give optimum fire suppression and resource management options.

The funds available to the landowners include cost-share payments, with the State paying up to 90 percent of the costs. There are no maximum or minimum acreage restrictions. However, participants must be able to guarantee payment of their share of the cost of site preparation and other operations and have a follow-up plan to manage the land which is to be treated under this program.

California Department of Forestry is responsible for leading the Chaparral Management Program and can provide further information on the program.

Federal and State Cooperative Financial Assistance

Pest Control

Under the State and Federal Cooperative Forest Pest Suppression Projects program, forest insect and disease suppression projects may be carried out on private lands with the objective of reducing forest insect and disease damage where such projects are economically and environmentally feasible. In California the area to be treated must be a declared zone of infestation delineated by the CDF and approved by the Board of Forestry.

Pest detection is a cooperative effort of CDF, U.S. Forest Service, landowners, industrial foresters, forestry consultants and timber operators. Pest damage observations are documented on a form entitled "Forest Pest Detection Report."

For suppression projects where federal financing is approved, the federal share cannot exceed 50 percent on landownerships greater than 500 acres. The State may share the balance of the cost, thus providing suppression at no cost to the landowner. Usually the State will enter into a three-part agreement (state/federal/landowner) whereby the landowner may provide 25 to 33-1/3 percent of suppression costs. Without federal participation the state can share 50 percent of the suppression cost, and under special circumstances up to 100 percent of the cost.

Service Forestry Program

The purpose of this program is to work cooperatively with private landowners, particularly smaller nonindustrial landowners, to upgrade the management of their lands and thus improve both the productivity of the land and degree of protection and enhancement of the forest resource system as a whole..." (Section 4792 of the Public Resources Code)

This cooperative program is partially funded by the Forest Service through the Cooperative Forestry Assistance Act of 1978. This Act provides for federal assistance to states in furthering improved forest management practices. CDF presently budgets ten person-years for the Service Forestry Program. These forest advisors also provide for technical assistance required under the ACP and FIP cost-share programs as well as on Resources Conservation and Development (RC&D) projects.

Typical Service Forestry activities include preparation of simple forest management plans and advice and demonstration work of reforestation, timber stand improvement, forest pest control, consultant and contractor referral, harvesting methods, timber marking, timber volume estimation for sale of timber, and primary processing of forest products. The program is to develop landowners' awareness of management possibilities and needs, and to refer landowners to consultants and contractors who can provide complete services.

Cooperative Extension Forestry Program

The University of California Cooperative Extension Program, cooperatively financed by federal, state and county governments is staffed with five forestry specialists and forestry advisors who develop and deliver forestry education materials and programs. These are based on research and field

developments to inform forest landowners, foresters, timber operators, wood processors and the general public on forest resource management, protection and utilization.

In recent years the extension forester, in cooperation with the Society of American foresters, has developed a series of training sessions, workshops and seminars designed to meet the needs of both the professional forester and the private landowner.

CHAPTER VI

IMPACTS AND ISSUES

Through a review of the previous chapters, the reader has been introduced to the Santa Cruz Mountain vegetation, the process of planning and conducting a timber harvest operation, the selection silviculture system, various state and county regulations for timber harvesting and management, and timber management potential in the County. This Chapter identifies various environmental impacts and policy issues relative to timber harvesting and management. Accompanying a discussion of the impact or issue is an analysis of the concern and a recommended method for addressing regulatory improvements required.

A recurrent theme found throughout the Chapter is the importance of recognizing the unique conditions which exist in the Santa Cruz Mountains relative to timber management. Urban population centers are located in close proximity to timbered areas; water supply watersheds are our local privately-held forest lands; and there is a great presence to utilize local forest lands for uses other than timber production.

The first section of the Chapter addresses the most frequently discussed of the potential environmental impacts associated with timber harvest operations - water quality. The following sections deal with the other common classic environmental issues - noise, visual resources, log hauling, fire hazard, forest ecosystem, sustained yield, and cumulative impacts.

The next section addresses a number of issues related to CDF's timber harvest review process, including: noticing; timber harvest plan contents; review team composition and authority; availability of documentation; public hearings; nonconcurrence; and appeals. This section also discusses Assembly Bill 3838 and possible changes it may have on the THP review process.

The last section of the Chapter addresses various issues relative to development activities. Those include: Timber Production Zoning; Land Division in TPZ; Land not zoned TPZ; and use of the timber harvest process to circumvent local land use regulations.

The policy recommendations presented throughout this Chapter are more formally presented and formatted in Chapter VII.

WATER QUALITY

Of all the issues concerning timber harvests, water quality is one of the most controversial. Past harvesting practices have contributed to widespread public opinion that timber harvests have a detrimental effect on water quality.

This section discusses potential pollutants related to timber harvest activities and water quality. Of these, erosion and sedimentation impacts which could result from road, trail and landing construction are the main concern.

The chemical, physical, and biological nature of stream water fluctuates constantly in response to both natural forces and human influences. Human activities can effect water quality in a variety of ways. Five kinds of pollutants may cause water quality degradation in timber harvesting: pesticides, nutrients, organic matter, water temperature and sedimentation.

Pesticides

The purpose of using pesticides in the forest is to make seeds and seedlings undesirable to foraging animals, to clear brush prior to planting, to control fast-growing woody brush that overtops conifers and to control insects that may be damaging to commercial tree species. Elsewhere, these chemicals are applied by air. However, due to cost, land ownership patterns, and the terrain of the Santa Cruz area, the only practical method of application is to spray undesirable species by hand on an individual basis. Currently the use of pesticides is regulated by the California Department of Food and Agriculture (CDFA), and by the County Agriculture Commissioner. These two agencies have developed standards for application of controlled substances and require that permits be issued to individuals proposing to use them. Pesticides have historically been little used in Santa Cruz County for forestry purposes.

Policy Recommendation:

- o **The County Agricultural Commissioner and the State Department of Food and Agriculture should continue to evaluate and control the use of pesticides or herbicides, specifically those used for forestry purposes. In addition, the public should be notified, through the timber harvest review process, if controlled substances are proposed for use for timber management purposes within the County.**

Nutrients

Organic and inorganic nutrient content effects the productivity of streams. The amount of detritus (living and non-living organic material of aquatic or terrestrial origin) and dissolved organic material provides the main food base for the ecosystem. While an abundance of nutrients are necessary to support stream life, excessive amounts may overload the stream ecosystem, resulting in an increase in algal growth. In extreme cases, algal blooms may occur, creating eutrophic conditions. Under such circumstances, algae may be considered a pollutant.

Timber harvesting has the ability to affect nutrients in four ways: uptake of nutrients by the vegetation is stopped, living nonmerchantable tree tissue is converted into decomposable slash, the decomposition rate of the residues and dead roots is increased by a warmed and moistened environment, and soil erosion is increased (Fredriksen & Ross, 1974). As a result, nutrients are released in quantities in excess of the requirements by vegetation and the ability of soils to store them. In clearcut timber harvests increased nutrient losses via surface runoff and streamflow can be expected until the uptake of nutrients by vegetation is again balanced with the release of nutrients through decomposition. In Santa Cruz County selection silviculture substantially mitigates the potential nutrient overload in the streams by retaining at least 50% of the vegetation adjacent to streams possessing a designated Watercourse and Lake Protection Zone.

Organic Debris

Organic debris may consist of vegetation or simple organic compounds, the latter being addressed under the subhead "Nutrients". In addition to the problems addressed in regard to nutrient levels, a variety of water quality problems stem from excessive organic matter.

As a consequence of the major storms in the Santa Cruz area in 1982 and 1983, a major contribution of organic matter to the channel network has occurred in the form of debris accumulations. In addition to being a major contributor of organic matter, these debris accumulations increase localized flooding, aggravate stream bank erosion, and create barriers to fish migration.

While many areas of debris accumulation have been cleared by various government agencies since the storms of 1982 and 1983, this is an ongoing land management activity which should be encouraged of all timberland owners.

Policy Recommendation:

- o The feasibility of removing debris accumulations should be evaluated through the timber harvest review process. The plan submitter should be encouraged to remove these barriers in cases where removal has been found to be both advisable and feasible.

Water Temperature

The primary source of heat energy for a stream is solar radiation. Other parameters which affect the amount of heat received at the stream surface include: surrounding vegetation, topography, stream channel characteristics, inflow of surface water and groundwater, and velocity of the stream. A change in stream temperature depends on the total heat received and the total volume of water heated. Shallow streams at low flows are most responsive to incoming heat.

Research indicates that there is a strong relationship between reduction of streamside vegetation and water temperature increases. (Tarrant, 1970) Increases in temperature may be extreme enough to reduce fish populations. Streams in logged drainages in Oregon have shown temperatures to be as much as 10 degrees higher in areas where riparian vegetation was completely removed. Two years after a clear-cut of a Douglas-fir forest, stream temperatures were 28 degrees higher than water in a similar unlogged stream. On a patch cut watershed with a buffer strip along the main stream, however, the temperature increased only a few degrees. (Board of Forestry, 1979) Higher water temperatures can increase the metabolic requirements of fish to a level which cannot be sustained by the food resources present. Increased solar radiation may also induce rapid algal growth resulting in oxygen depletion and fish mortality.

The inflow of groundwater has a significant cooling effect on some streams - more so than local shading of a stream. A large-scale test in the Unpqua Basin in Oregon showed that a logged-over area had caused the warming of water upstream from a shaded riparian area. (Brown, et al, 1971) The riparian vegetation had little effect on lowering the water temperature compared to the effects of groundwater inflow. Temperature increases will be most critical in streams with high groundwater temperatures and excessive levels of nutrients. Special management practices should be considered in these problem areas for water temperature control. The selection silvicultural system which is used in Santa Cruz County does not result in significant canopy removal adjacent to streams. Potential increase in water temperature resulting from timber harvest operations is therefore not a major concern locally. Evaluation of stand density adjacent to Class I Watercourses should be conducted, however,

to determine whether appliation of Forest Practice Rule canopy retention standards are appropriate on a site by site basis.

Policy Recommendation:

- o **Encourage participation in the timber harvest review process by Fish and Game for harvests adjacent to Class I Watercourses.**

Sediment

Sediment is considered a pollutant when it occurs in amounts greater than background, or natural levels. As a result, it is difficult to define water quality by setting limits or standards for this constituent of water that is now viewed as a pollutant but has historically been part of the ecosystem.

In Santa Cruz County sediment is the most common non-point water pollutant from forested lands. Sediment can clog stream gravels and reduce spawning and rearing success of anadromous fish populations, it can make drinking water unpalatable, and can damage drainage facilities and water intakes. Sedimentation of County streams has led to a significant decline in salmon and steelhead populations in recent years.

There is a clear distinction between erosion and sedimentation, but the two are closely related. Erosion is defined as the detachment or removal of material from the land surface. Once detached, soil particles may be carried downslope by surface runoff. When eroded material enters the stream system it is transported as sediment load. Input of large amounts of sediment may decrease the capacity of a stream system to transport sediment. When this occurs, sediment settles to the channel bottom and may increase flood hazard and damage fish habitat.

Logging may increase erosion and thus sedimentation depending on the location and design of roads and skidtrails, erodibility of the soil, and rapidity of revegetation of exposed areas. (Tarrant, 1970)

Soils Erosion Processes, and Sedimentation

As earlier mentioned in Chapter 2, soil may be defined as the "aggregate of weathered minerals and decaying organic matter which covers the earth in a thin layer" (Dodge, et al, 1976). The decaying organic matter (humus), interwoven roots and underlying weathered rock constitute a stable fabric which retains water and minerals, protects the mountain slope from rapid erosion and provides plants with the substances needed for growth. Because of

the great time required for its formation, soil is commonly considered a non-renewable resource.

Erosion of soil and sediment transport are natural processes that act to remove, transport and redeposit soil and rock materials. Vegetation removal and soil disturbance can greatly accelerate erosion and lead to sedimentation of the stream system. In Santa Cruz County, excessive erosion has significantly degraded fish habitat and water supplies and has increased the flood hazard in urban areas adjacent to streams.

The processes of erosion can be broadly classified into two types; surface erosion and mass erosion. Surface erosion is defined as movement of individual soil particles by forces other than gravity alone, such as overland flow of water and raindrop impact. Mass erosion occurs when soil is transported primarily by gravity. Examples of mass erosion include various types of landslides plus nonrainfall associated erosion (dry creep).

Surface erosion is a function of three factors: the magnitude of forces available (wind, raindrop impact, overland flow), the inherent erosion hazard at the site in question (soil detachability characteristics, slope gradient, etc.), and the amount of material available to protect the soil surface. (Megahan, 1977)

Mass erosion is controlled by the balance of shear strength and the shear stress within the soil or fill material at the site in question; as long as the shear strength exceeds shear stress, the site remains stable. (Ibid)

Mass movement of soil in timber harvesting activities is mostly related to road construction. (Board of Forestry, 1980) Although some disturbance of surface soil results from felling trees and yarding of logs, the erosion rate of the surface soil does not appear to be excessively high when compared to mass erosion caused by road construction. The nature of site disturbance by the two erosional processes is very different. Mass erosion (landsliding) usually removes a cross-section of all soil horizons, often including all or part of the underlying parent material, but disturbs a relatively small surface area. The converse is true for surface erosion.

Research indicates that a potential correlation exists between timber harvesting and impacts to soil and water resources. In particular, erosion and sedimentation contribute to water quality problems, especially when ground disturbance occurs. Areas are more prone to erosion when there is ground disturbance on steep slopes, the parent material is well weathered, and/or soils are easily erodible.

The following discussion will identify and discuss impacts which may be associated with timber harvest operations which affect soil and water resources. In addition, resource protection provided by current Forest Practice Rules will be critiqued and, where appropriate, recommendations for possible action are presented.

Watercourse and Lake Protection Zone

Protection of watercourses during timber harvest operations is critical to ensure the maintenance of public health and safety and to ensure that fishery habitat is preserved. The Forest Practice Rules recognize the importance of establishing a buffer strip between certain timber harvest activities and adjacent streams. The Watercourse and Lake Protection Zone was established by the rules to protect water quality by serving as a filter for surface runoff from timber harvest operations which may contain sediment.

The State Water Resources Control Board (SWRCB) is the agency responsible for certifying best management practices for silvicultural activities in the state. In 1979, staff to the Board of Forestry prepared a report which identified deficiencies in the Forest Practice Rules with respect to the protection of water quality, and made recommendations for regulatory improvements. The Board of Forestry subsequently entered into an agreement with the SWRCB to undertake revisions to the rules for the purpose of developing silvicultural best management practices. Rule revisions were completed and adopted by the Board of Forestry in October of 1983 and submitted to the SWRCB for certification as best management practices.

In a report analyzing these rule revisions, State Board staff had several major concerns regarding the adequacy of the revised rules for protection of water quality. The SWRCB felt that insufficient information existed to make an informed decision regarding certification of the revised rules. The Board voted, in June of 1984, to certify the revised rules for an interim four year period, with final certification to be based upon information gathered from a four year water quality monitoring program.

This water quality monitoring effort was proposed to be carried out by staff to the State Water Resources Control Board and Regional Water Quality Control Boards within the five Forest Districts of the State. For a number of reasons, concern arose that the sampling program proposed by the State Board would not provide information that reflected local conditions.

Timely collection of water quality samples is crucial for the generation of accurate data. Peak storm flows must be sampled to gain an understanding of the amount of sediment mobilized by surface runoff. The data record is

incomplete if peak discharges, and the sediment they carry are not documented. The intensity with which sampling is conducted is of equal importance. Sediment sampling must be carried out under a wide variety of flow conditions to adequately characterize sediment yield.

The physical locations of both the State and Regional Board offices place constraints on their respective staffs to conduct a monitoring program in Santa Cruz County which would accurately reflect water quality impacts resulting from timber harvest operations. Travel time to Santa Cruz from both the State Board offices, located in Sacramento, and the Regional Board offices in San Luis Obispo is approximately three hours. The physical separation was seen as a severe limitation on the ability of State and Regional Board personnel to collect water quality samples in a timely manner. Similarly, these distances would preclude the intensity of sampling necessary for the generation of reliable data.

Finally, because the volume of timber harvested in Santa Cruz County is low relative to that harvested in the northern coast region of the state, a fear persisted that a majority of the funds designated for the State's monitoring program would be allocated for sampling efforts along the north coast. It was felt that an intensive, locally conducted sampling effort was needed to account for the unique combination of factors found in Santa Cruz County.

For these reasons, the County of Santa Cruz applied for, and was awarded a Section 205(j) Water Quality Planning grant from the State Water Resources Control Board to conduct a timber harvest water quality monitoring study locally. The purpose of this three year study is to evaluate the adequacy of the State Forest Practice rules in the area of water quality protection. Tributaries on or adjacent to timber harvested parcels will be monitored before and after timber operations to determine whether sediment transport rates increase significantly.

A final report documenting study findings will be submitted to the State Board in June of 1988. If the study findings indicate that the present Forest Practice Rules do not adequately protect water quality during timber harvest operations, recommendations for regulatory improvements will be made. The study recommendations may be used by the State Board during their deliberations on final certification of the Forest Practice Rules.

Policy Recommendations:

- o Monitor the State Water Resources Control Board timber harvest water quality sampling program and provide input where appropriate.

- o **Conduct the 205(j) Timber Harvest Water Quality Monitoring Study and present findings to the State Water Resources Control Board for their consideration during deliberations on final certification of the revised Forest Practice Rules as Best Management Practices.**

Road and Landing Construction on Steep Slopes

Current Forest Practice Rules restrict use of tractors on slopes greater than 65 percent and on slopes greater than 50 percent possessing a high or extreme erosion hazard rating to protect water quality from the effects of erosion. The rules place few limitations on road construction in highly erodible areas, however, and do not provide clear standards to guide decision makers during the review process.

Due to high intensity rainfall, steep slopes, unstable geology, and erodable soils, road and landing failures do occur in Santa Cruz County. Such failures have a high potential for degrading water quality and impairing the ability of downstream residents to divert potable water for domestic use. Roads and landings constructed on overly steep and erodable slopes do not result in good long-term timber management. There is a need to adopt standards for road and landing construction in steep highly erodable areas to achieve better protection for watershed resources.

Policy Recommendation:

- o **Petition the state for special regulations governing road and landing construction on steep slopes.**
- o **Encourage long lining logs to existing roads where possible to reduce soil disturbance.**

Erosion Hazard Rating

The Erosion Hazard Rating, prepared by the RPF and submitted with the THP, is meant to provide information about the relative erodability of different areas to be harvested. The Erosion Hazard Rating dictates the type of yarding systems allowable and the spacing of waterbars or other drainage facilities along timber harvest roads. Generation of an erosion hazard rating value is based upon the physical properties of soil found on the site, slope, the amount of protective vegetation remaining after harvesting, and rainfall intensity (with slope and soil type being heavily weighted factors).

The RPF generally refers to Soil Conservation Service Soil Survey maps for information relating to soil types found on the property in question. Of necessity, these are large scale maps which do not depict the soil type at a specific site. Rather, they are meant to provide a broad interpretation of soil type locations. Reliance on these maps may produce an inaccurate assessment of the potential erodability of the property being subjected to timber harvesting.

Above ground vegetative plant parts provide protection against erosion by intercepting rainfall which could detach soil particles through the force of its impact. Roots, on the other hand, help to bind the soil and keep it from being carried downslope. Removal of vegetation can, therefore, decrease soil cohesion and increase the potential for erosion. The erosion hazard rating system may underestimate the role that vegetation removal plays in erosional processes.

Policy Recommendation:

- o **Evaluate the Erosion Hazard Rating system to determine its effectiveness in accurately predicting erosion potential through the 205(j) Timber Harvest Water Quality Monitoring study. Petition the state for changes to the Erosion Hazard Rating System if study findings indicate that revisions are necessary.**

VISUAL RESOURCES

Santa Cruz County recognizes that scenic resources are an important and valuable amenity and that the scenic, wooded, open space and rural character of the County should be maintained and protected. The County General Plan recognizes the need to encourage the economic use of protected natural resources, but only to the extent that their visual character or scientific value is not impaired.

The assessment of possible visual resource impacts has been organized into the following three categories: scenic backdrops, visual corridors, and neighborhood impacts.

Scenic Backdrops

The Santa Cruz Mountains provide a densely vegetated scenic backdrop from almost any viewing point in the County. Whether from 5 miles or one-quarter mile away, the mixed evergreen and redwood canopy cover is the most significant vegetative feature of this vista.

The selection system of timber harvesting has been in operation in this County for some time. By allowing the removal of only a percentage of the mature trees, the selection system effectively reduces the impacts to distant scenic vistas. Unless one is extremely familiar with a particular hillside or canyon it is virtually impossible to detect that a recent timber harvest has occurred.

Visual Corridors

Throughout Santa Cruz County, particular areas are considered significant visual resources and are designated as such in the County's General Plan and the Local Coastal Plan. These areas primarily include scenic roadways and areas adjacent to State Parks and are scattered throughout the county. It is widely recognized that these areas may require special protection. Potential impacts to visual resources from timber harvest activities are currently evaluated during the timber harvest review process.

Policy Recommendation:

- o Continue to evaluate possible impacts to visual resources from timber harvests through participation in the timber harvest review process.

Neighborhood Impacts

Undoubtably the greatest concern about visual impact occurs when timber harvesting is undertaken on a neighboring land parcel. Fear of significant viewshed degradation is common. Generally such concerns are put to rest when neighbors learn that selective harvesting is the only type of silvicultural system permitted in this County. Most neighbors would agree that the infrequent thinning of harvestable sized trees is a reasonable trade off for living in an area that grows commercial timber. This would be particularly true if buyers were notified of adjacent TPZ parcels at the time of home purchase.

Policy Recommendation:

- o Explore the feasibility of recording deed notices for properties adjacent to TPZ land to notify the owners that timber harvesting may occur on the adjacent property. This would serve to warn them of short-term impacts which could arise from adjacent timber harvesting activities.

LOG HAULING

The narrow, winding roads prevalent in areas of Santa Cruz County subject to timber harvesting are heavily used by mountain residents. In addition to vehicular traffic, the narrow, and in some places virtually nonexistent, road shoulders are used by pedestrians, many of whom are school age children. It should be noted that log truck operators have an excellent record of safe driving in Santa Cruz County. Nevertheless, residents are reluctant and fearful of sharing roads, which can be dangerous under normal driving conditions, with large, powerful log trucks. Because of extensive damage to the county road system during the winters of 1982 and 1983, much of which has not been fully or permanently repaired, there is heightened concern among members of the public about further road damage. Log hauling operations are perceived as a possible threat to both public and private mountain roads and must, therefore, be analyzed carefully.

The presence of numerous roads in wooded portions of the County provides a measure of flexibility to the RPF in selecting a haul route for a timber harvest operation. The shortest haul route is often chosen, however, for economic reasons rather than based upon knowledge about residential areas or dangerous road conditions along the route. Haul routes chosen with lack of adequate planning can jeopardize public safety and further degrade public and private mountain roads.

Currently, the Forest Practice Rules do not provide authority for the Director to require use of an alternate haul route if the route proposed in a timber harvest plan is determined to be hazardous to public safety or can result in damage to public or private roads. The net result is a perception by the public that the State timber harvest review process does not provide for their protection in this area.

Policy Recommendation:

- o **Petition the State to authorize the Director to require use of an alternate haul route if use of the proposed haul route would jeopardize public health and safety or result in damage to public or private roads, or seek state legislation to accomplish such objective.**

FOREST ECOSYSTEM

Use of the selection silvicultural system, while less environmentally damaging than other timber harvesting methods, does affect flora and fauna in terms of species composition and population numbers. Impacts to flora and fauna can be attributed to the removal of mature trees along with the disturbance caused by

road and landing construction and the yarding system used during operations. Mammals, birds, reptiles, amphibians, fish, and plant life are all affected at least temporarily by logging activities. The removal of vegetation cover affects habitat requirements for nesting, territory, and food.

A majority of the biomass in a redwood forest exists in the form of mature trees, with very little understory vegetation present. In general, land mammals favor lower growing, more sunlight-demanding vegetation rather than the large trees forming the forest canopy. After a harvest, wildlife best adapted to a habitat dominated by a heavy forest canopy are replaced by species better adapted to more open conditions and lower, more accessible vegetation. Shifts in species compositions are usually minor, however, particularly under the selection silviculture practice used in Santa Cruz County.

Under the selection system, birds may be among the most seriously effected terrestrial vertebrates. Timber harvesting removes nesting sites, roosting trees, and "graneries," those trees used by acorn woodpeckers to store food. The extent to which these changes affect bird species in Santa Cruz County are not fully understood or well documented. The significance of this issue should be discussed with Department of Fish and Game biologists. If this habitat loss is deemed to be significant, guidelines for conditioning timber harvests should be developed.

Perhaps the most serious threat to wildlife is the potential for sedimentation and its effect on fish habitat. Sediment can damage or destroy habitat required by fish species for spawning and rearing purposes. As previously mentioned in the Water Quality section of this document, the adequacy of the Forest Practice Rules in the area of water quality protection will be evaluated as part of a Timber Harvest Water Quality Monitoring study funded by the State Water Resources Control Board. Study findings will be presented to the State Board during their deliberations on final certification of the Forest Practice Rules as Best Management Practices.

Rare, endangered, or unique plant species or habitats may be damaged by timber harvest operations. Presently, the plan submitter checks for the presence of rare, endangered, or unique plants on the subject property by reviewing biotic resources maps prepared by the County Planning Department. The RPF indicates on the timber harvest plan whether these maps depict rare, endangered, or unique plants on the subject property. Necessary mitigation measures may be developed during plan review of timber operations as to their impact on rare endangered, or unique flora.

Riparian vegetation is an extremely important plant community which may be damaged by timber harvesting operations. In Santa Cruz County predominant riparian species include willow, alder, cottonwood, sycamore, and dogwood.

The riparian corridors adjoining watercourses protect fisheries resources by maintaining low water temperature through shading, providing cover and nutrients, and by trapping sediment before it can reach the watercourse. The roots of this vegetation provide soil strength and prevent or reduce streambank erosion, thereby protecting fisheries resources as well as bridges, roads, and structures which would otherwise be endangered by high stream flows. The Soquel Creek Storm Damage Recovery Plan, prepared by the Soil Conservation Service after the flood event of 1982 identified an additional important benefit provided by riparian vegetation. The authors of that report observed that during high stream flows riparian woodlands filter a great deal of large woody debris out of the stream. Contrary to a commonly held belief, the authors stated that riparian woodlands trap more woody debris during high flows than they contribute, and reduce the potential for damaging debris jams downstream.

Current Forest Practice Rules require the maintenance of a shade canopy near streams and the protection of a corridor along streams. Because of the importance of a stream shade canopy and an adjacent vegetated buffer strip the adequacy of these measures to protect water quality requires careful evaluation and strengthening where appropriate.

Policy Recommendations:

- o Develop appropriate mitigation measures for protection of bird habitat if, through discussions with the Department of Fish and Game, habitat losses due to timber harvesting are deemed to be significant.
- o Assist in the development of mitigation measures for protection of rare, endangered, or unique plant species.
- o Evaluate current Forest Practice Rules to determine whether they provide adequate protection for riparian corridors located adjacent to timber harvest operations, and seek new state regulations, or state legislation, if necessary, to provide adequate protection for riparian corridors.

SUSTAINED YIELD

Historically, the privately owned forests of the United States have been cut on the basis of short-term demand rather than long-term supply. The timber industry started in New England, cut the valuable species there, cut through the Lake States and the southern pines, and is presently winding down the harvest of old growth timber on the Pacific Coast. This historic trend has led to a public perception that unrestrained short-term local demand for timber may lead to overcutting, precipitous decline of sawtimber stocks, mill closures, and attendant economic and environmental effects.

Sustained yield is the classical European concept which has traditionally been proposed as a governmental means to dampen the boom and bust cycle (and its associated impacts) which an unrestrained timber market produces. Having experienced overcutting in the early 1900's, Santa Cruz County is understandably concerned that the level of harvest not exceed the average rate of growth.

Perhaps no concept in forestry is more complex, and more subject to misinterpretation, than sustained yield. Several definitions provide a general idea of what is meant by sustained yield, but may leave the forester or planner with no direct guidance for the application of the concept to a particular acreage of forest land. The following definitions indicate the variety of perceptions of the concept of sustained yield:

1. The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources...without impairment of the productivity of the land. (After Multiple Use-Sustained Yield Act)
2. The yield that a forest can produce continuously at a given intensity of management. Sustained-yield management, therefore implies continuous production so planned as to achieve at the earliest practical time a balance between increment and cutting. (Ford-Robertson 1971)
3. The yield that a renewable resource can produce continuously at a given intensity of management. (After Ford-Robertson 1971) (Schwarz, Thor, and Elsner, 1976)

The original purpose of sustained yield was to try to achieve a greater level of economic stability in small rural communities dependent upon sawmills, through restraining and scheduling the cutting of timber so that sawmills, and hence local economies, could be sustained indefinitely, rather than suffering a boom - bust cycle.

Public and professional debate over sustained yield in the United States has mostly dealt with management of western National Forests which hold substantial stocks of old growth timber. The existence of old growth timber complicates the concept of sustained yield because the volume immediately available for harvest vastly exceeds both current net growth, which is usually small in old growth stands, and projected future growth of young stands. Since the productive forest stands of Santa Cruz County are all young growth, average age of inception being 1904, it might theoretically be easy to determine a reasonable level of sustainable yield. Unfortunately, other considerations complicate the matter.

The background material for this discussion takes place in Chapter III, "Silviculture and Timber Yield". As was noted in that Chapter, Oswald (1979) estimated that the average acre in Santa Cruz could produce, if properly stocked, about 175 cubic feet per acre per year. Aggregated over the approximately 135,000 acres of commercial forest land in the County, this productive potential converts to about 130,000,000 board feet per year. This is a figure that estimates the long-term potential to grow timber if all acres were managed intensively and harvested at optimum intervals. The figure represents a theoretical maximum value only.

Both Pillsbury (1979) and Oswald report a current annual growth countywide of approximately 85,000,000 board feet. This figure is of interest because it indicates that the productive potential of the County's timberlands is substantially higher than actual present production.

The bulk of timber growth currently is redwood, amounting to about 60,000,000 board feet per year. The rest is Douglas-fir, which is occasionally harvested, and other species which are seldom harvested. Some of the redwood growth is occurring on parcels which are not available for harvest in the short run, and which some feel may never be available for harvest, the opinion of the Forest Service notwithstanding (see Chapter V). It is difficult to say with certainty how much of the County's annual growth is really available for harvest in the short run, that is, how much redwood growth is occurring on properties that have any chance of being logged. Regardless of biological growth, timber that cannot be cut will not keep a mill open.

Still, it appears that if 60,000,000 board feet of redwood is being grown annually, a substantial portion of this volume is available for harvest. Numerous applications for timber harvesting permits are received proposing to log parcels in the 3-20 acre category, and although constraints are greater, lowering stumpage prices, such parcels usually are harvested. Timber growth available for harvest is short of the 60,000,000 total redwood growth, but calculating the actual amount available is highly speculative. As stated earlier, redwood continues to grow even if not cut, and thus properties which are not cut today will continue to grow timber for the future. Clearly some conflicts exist which will preclude harvesting of some areas virtually forever. One could speculate that roughly 40-50,000,000 board feet of redwood are being grown annually in the County which can be reasonably considered available for harvest. The reader is cautioned however, that this is merely an estimate which is not based upon well documented evidence.

The current economic depression in the lumber industry has reduced harvesting precipitously, but the history of the lumber industry is dominated by cyclic ups and downs, more so than the general economy. Assuming that the current slump is another cyclic low, harvesting may be expected to rise substantially in the future. The long-term average harvest in Santa Cruz County has been between 15-20,000,000 board feet annually. Some of this has been Douglas-fir, but for practical purposes it might be considered all redwood. It is therefore apparent that average current cutting is substantially below average current growth.

In summary, three points arise from a discussion of sustained yield in Santa Cruz County:

1. Current harvest is well below current growth. Santa Cruz is not being overcut. Growing stock is increasing.
2. Current growth is somewhat less than potential growth. An opportunity exists, through more intense management of some stands, to increase future growth substantially.
3. Use of the selection silvicultural system in Santa Cruz County has the effect of requiring and achieving sustained yield forest management.

Policy Recommendations:

- o Continue to monitor timber harvest activities to assure that current limits of sustained yield are not exceeded.

CUMULATIVE IMPACTS

Cumulative impacts are defined by the California Environmental Quality Act as the change in the environment which results from the impacts of a project when added to other closely related past, present, and reasonably foreseeable future projects. This definition further states that cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. There is growing concern and sensitivity on the part of the public about the potential for timber harvest activities to generate cumulative effects. It should be noted, however, that timber harvesting is not the only activity occurring in the forested areas of the county with a potential to generate cumulative effects. Private road construction and residential development can also lead to cumulative impacts which may be difficult to separate from those generated by timber harvesting activities.

State timber harvest permits are valid for a period of three years, allowing for the approval and possible implementation of a number of operations within a relatively small geographic area. This may become problematic in small, intensively developed watersheds containing streams used for domestic water purposes. Private water purveyors generally have no alternate water supplies and are therefore unable to meet the demands of their customers if water quality is significantly degraded due to the combined effects of multiple timber harvests.

The Forest Practice Rules contain provisions which, when applied to individual harvests, provide adequate protection for maintenance of water quality. However, it is uncertain that they will protect against combined effects from numerous operations occurring within a small watershed. Timber harvest proposals should be evaluated to determine their potential for cumulative impacts, with regard to past, present, and reasonably foreseeable future harvests in the area.

Additional information must be available during the review process in order to address these concerns. If review indicates that the potential for cumulative impacts is significant, CDF must have the regulatory authority to mitigate these impacts through application of special standards or, in cases where resource damage cannot be avoided, to deny the timber harvest plan in question.

Road and landing construction present the greatest potential for erosion and degradation of water quality both during and following timber harvest operations. Timber harvesting in Santa Cruz County results in a good deal of new road construction due to the existence of many small parcels which require additional roads to access timber stands. The constraints that small parcels

place on road layout can have deleterious effects on water quality by necessitating that road construction occur in sensitive areas for lack of less damaging alternatives. Road construction activity on numerous small parcels within one watershed has the potential to generate cumulative impacts, degrading water quality, and impairing public health and safety.

Shared road networks constructed and used for the purpose of timber management by adjacent landowners can overcome many of the problems created by construction of road systems on individual parcels. Consideration of shared road systems could provide the forester with desired flexibility in road layout and provide alternatives to road construction in sensitive areas if certain portions of a stand could be accessed more easily from an adjacent parcel. Overall road system length may be reduced if existing roads on adjoining properties can be used, resulting in a decreased potential for erosion.

Incentives for considering shared road systems should be developed. The RPF who develops the plan should contact adjoining property owners, where feasible, for the purpose of constructing and maintaining a shared road system to use for timber management.

Log hauling operations may also generate cumulative impacts in the form of damage to public and private roads and may jeopardize public safety. Use of all or portions of the same haul route by a number of simultaneously occurring timber operations can increase the risk of road damage and possible injury. Haul routes should be analyzed in light of their potential to generate cumulative impacts.

Policy Recommendations:

- o Consider expanding the information contained in timber harvest plans to provide an adequate level of detail for decision makers to analyze the potential for cumulative impacts.
- o Develop and propose special standards to be applied to harvests where the potential for cumulative impacts exists.
- o Encourage the use of shared road systems constructed and maintained by adjacent property owners for the purpose of timber management.
- o Develop procedures for the review team and CDF to use to analyze the potential for cumulative effects from log hauling operations.

TIMBER HARVEST REVIEW PROCESS

On July 1, 1983 individual counties throughout the state lost the authority to regulate timber harvesting activities due to passage of Senate Bill 856. Since that time there has been concern regarding the adequacy of the CDF timber harvest review process. These concerns center around the time allotted for review, the opportunity for public participation, and the lack of a County appeals procedure.

Another major issue which has surfaced since the loss of county regulatory authority is a dispute over the determination made by the state that the timber harvest review process is the functional equivalent of an environmental impact report. This issue, coupled with the questions regarding the constitutionality of the Forest Practice Act, has resulted in a number of legal challenges to the Act. The legislature has also attempted to correct timber harvest review procedural problems via passage of Assembly Bill 3838. This legislation is discussed at the end of this section.

Prior to embarking upon an analysis of the different components which together, define the CDF timber harvest review process, it is important to consider the framework which the Forest Practice Act establishes for this process. The intent of the Forest Practice Act is to assure that "the goal of maximum sustained production of high quality timber products is achieved while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment." Contrary to many other sections of the Public Resources Code, the intent section of the Forest Practice Act does not specifically identify public health and safety as an important element to be considered under its provisions. While many may argue that concern for public health and safety issues is implied by the Act and practiced by CDF, we must be cautious that these concerns are not overlooked during the plan review process.

While the following section identifies areas of the Forest Practice Rules which need improvement, these concerns should not be viewed as demonstrating a lack of confidence in local CDF staff charged with administering the timber harvest review process in Santa Cruz County. Local CDF personnel and County staff have developed a cooperative working relationship through the transition from local to State control of timber harvesting. This relationship has had beneficial effects on the quality of the review process. Still, CDF staff works within the constraints of the Forest Practice Rules and improvements to these regulations appear necessary in order to make review of timber harvest plans a more participatory process.

Noticing

Under the County timber harvest review process, residents were notified that timber harvesting was being proposed in the area and that the plan was currently under consideration. Also included in the notice was an explanation of the review process, the type of harvesting permitted in Santa Cruz County, and the environmental safeguards commonly required prior to plan approval. The information contained in the public notice was an effective tool in educating the public about timber harvesting within the county and, although not a panacea, it alleviated many of the fears commonly held by the public.

The plan submitter mails a Notice of Intent to Harvest Timber to residents in the area of a proposed timber harvest. After a date has been set for a public hearing, a Notice of Public Hearing is sent to all those individuals who received a Notice of Intent to Harvest Timber. The Notice of Intent merely identifies the general location of the proposed harvest, states the approximate number of acres in the plan, and gives the estimated earliest date for the Director's determination on the proposal. The Notice of Public Hearing identifies the date, location, and time set for a public hearing as well as the location where copies of the timber harvest plans may be obtained.

Quite often, members of the public that attend public hearings have very little knowledge about the timber harvest review process or the special timber harvesting techniques required within Santa Cruz County. In some instances, individuals have many of their questions answered during that portion of the public hearing dedicated to reviewing the Forest Practice Act, Forest Practice Rules, and the CDF permit process. If this same information were transmitted to the public at an earlier date, many of the anxieties experienced by residents of an area proposed for timber harvesting may be overcome. The end result of including this type of educational material in the public notice may be to increase public confidence in the CDF timber harvest review process.

Policy Recommendation:

- o Petition the state to include educational material for residents in their Notice of Intent to Harvest Timber, including information concerning the Forest Practice Act, Forest Practice Rules, CDF review process, and special silvicultural methods required within Santa Cruz County, or seek state legislation, if necessary, to achieve this objective.

Timber Harvest Plan Contents

The contents of timber harvest plans are specified in both the Forest Practice Act and the Forest Practice Rules, as discussed in Chapter IV of this document. Plan contents are critical elements for review of timber harvest proposals.

The Forest Practice Rules further require that the RPF who prepares the plan must conduct a feasibility analysis to explore alternative silvicultural systems, operating methods, and procedures, and to select an alternative that will minimize environmental impacts, while weighing economic factors. The current regulations specify that this analysis and need not be written.

During review of timber harvest plans the review team is required by the Forest Practice Rules to conduct its own feasibility analysis to determine whether the alternatives chosen by the RPF indeed constitute the best balance between economic interests and environmental protection. A problem arises for the review team due to the fact that the feasibility analysis conducted by the RPF is unwritten. The review team must evaluate the alternatives chosen by the RPF for a particular harvest without information as to the other alternatives which were considered. Many decisions made by the review team are therefore based on incomplete knowledge of the full spectrum of possible alternatives.

Often additional information not currently included in a plan is necessary to allow the review team to evaluate possible impacts from timber harvesting activities. Additional disclosures in the timber harvest plan would also allow for more in depth analysis by the public at large.

Policy Recommendations:

- o Petition the state for special rules requiring that the feasibility analysis conducted by the RPF be documented in writing to allow a more thorough evaluation of timber harvest proposals by the review team and the affected public. Seek state legislation, if necessary, to achieve this objective.
- o Conduct a review of required timber harvest plan contents and propose inclusion of additional information that would provide greater resolution to the timber harvest review process. Seek state legislation, if necessary, to achieve this objective.

Review Team Composition

The review team is charged with providing multi-disciplinary evaluations of timber harvest proposals. Personnel from CDF, Santa Cruz County, the Department of Fish and Game, and the Regional Water Quality Control Board regularly attend review team meetings. In addition, the Coastal Commission is notified of timber harvests which occur in the coastal zone.

The Regional Water Quality Control Board (RWQCB) is responsible for protecting the beneficial uses of water within the state, and toward this end the agency is represented on the review team. The staff member attending review team meetings has a background in wastewater treatment which does not necessarily pertain to the evaluation of water quality impacts resulting from timber harvest operations. In order to be truly multi-disciplinary, the review team should be composed of individuals whose professional experience is directly related to concerns raised by timber harvest operations.

Policy Recommendations:

- o **Encourage the Regional Water Quality Control Board to staff review team meetings with an individual whose professional experience is more directly related to evaluating possible water quality impacts from timber harvest activities.**
- o **Encourage Coastal Commission to attend review team meetings for harvests located within the coastal zone.**

Review Team Authority

The review team serves in an advisory capacity in the evaluation of timber harvest proposals. The review team meetings are chaired by CDF and it is the review team chairperson who ultimately formulates the review team recommendations.

The review team is bound by the Forest Practice Rules as to the type and extent of suggestions which will be accepted for incorporation into the review team recommendations. When suggesting mitigation measures for incorporation into a plan, those measures must be consistent with existing rules. On the other hand, an RFP, as in the case of in-lieu watercourse and lake protection practices, may propose measures that are based on site specific considerations provided that the in-lieu practice results in protection equivalent to existing rules. The rules do not extend such flexibility of judgement to the review team members, thereby placing certain constraints on the review team in reviewing plans.

Policy Recommendation:

- o **Attempt to provide the review team with additional flexibility for proposing mitigation measures for timber harvest proposals; seek state legislation, if necessary, to achieve this objective.**

Availability of Documents for Evaluation by Review Team

In addition to evaluating the timber harvest plan submitted by the RPF and visiting the subject property, the review team relies on information contained in CDF's preharvest inspection and, where applicable, the geologic evaluation prepared by the California Division of Mining and Geology (CDMG) in making its recommendations. The preharvest inspection reports are often not received by review team members until the day of the review team meeting. Prior to formulating recommendations on a timber harvest plan the review team, under this scenario, can only evaluate the preharvest inspection reports in a cursory manner.

A similar situation exists regarding the availability of the CDMG geologic reports for review. Because of time constraints these documents are often not available until after the review team meeting, and in some cases not until after the decision to approve the plan. The review team, therefore, has little opportunity to analyze or comment on information pertaining to the geologic review of timber harvest proposals.

The 10 additional days for review of timber harvest proposals provided by Assembly Bill 3838 (discussed previously in Chapter IV) may help to address the concerns discussed above. The intent of the Board of Forestry as to how the additional time will be apportioned is unknown at this time, however.

Policy Recommendation:

- o **Propose special forest practice rules to the state that would apportion the additional 10 day review period provided by AB 3838 to ensure that adequate time is allowed for evaluation of all pertinent information and documents by the review team and the concerned public. Seek additional state legislation, if necessary, to provide for adequate time to review timber harvest proposals.**

Public Hearings

Forest practice regulations were amended in 1984 to allow for public hearings as part of the timber harvest review process. The Forest Practice Act specifies that the County must request a public hearing on a timber harvest plan within seven calendar days of the date which CDF mails a copy of the plan. Because of the difficulty of visiting the site and gauging public concern within this short period of time the County requests public hearings for almost every proposal. Many of these hearings are unnecessary, with few or no members of the public in attendance. Unnecessary public hearings can be avoided if ample time is given to conduct a site visit prior to the deadline for a hearing request. Postponing the deadline for public hearing requests until after the preharvest inspection may solve this problem.

In order to supply constructive testimony concerning timber harvest plans the public must be informed about the details of a plan, including actions taken previously in the review process which amended the originally submitted proposal. Presently, public hearings are often held so soon after the review team meeting, that the written review team recommendations are not available for public scrutiny. Similarly, the CDMG geologic report is often not available prior to public hearings. The public should have adequate time to review the preharvest inspection report, the review team recommendations, and the CDMG geologic report.

Following public hearings CDF determines whether any significant issues were raised by the public. If, in their estimation, substantive concerns were aired during the hearing, the Regional Resource Manager responds in writing as to how the concerns have been addressed by CDF. The Regional Resource Manager, however, is not as familiar with the proposal in question as the review team chairperson. A written response by the review team chairperson would be preferable because of the detailed knowledge of the proposal which he or she possesses.

Policy Recommendations:

- o **Attempt to alter existing rules requiring the County to request public hearings within seven days of receipt of plans. Propose that the deadline for a request for a public hearing be set after the preharvest inspection in order to allow County staff to visit the site prior to determining whether a public hearing is necessary. Seek state legislation, if necessary, to achieve this objective.**

- o Propose special rules requiring that all documents pertaining to a timber harvest under consideration be made available to the public for a reasonable period of time before a public hearing. Seek state legislation if necessary, to achieve this objective.
- o Propose a special rule requiring that the major issues statement prepared by CDF subsequent to a public hearing be written by the same local personnel involved in review of the proposal. Seek state legislation, if necessary, to achieve this objective.

Non-Concurrence

Under existing Forest Practice Rules if a review team member does not agree with the chairperson's recommendations to the Director pertaining to approval or disapproval of a timber harvest plan, he or she may submit a formal protest. The non-concurrence must be received by CDF within five days of the review team meeting and must provide specific reasons why the chairperson's recommendations do not adequately protect the resources on or adjacent to the subject property. This submission must also include recommendations to the Director on how the deficiencies should be corrected.

Because AB3838 provides authority to counties to appeal the approval of timber harvest plans to the Board of Forestry, the non-concurrence process should function as a vehicle for attempts to solve minor disputes over timber harvest plan approval locally.

Policy Recommendations:

- o Evaluate the non-concurrence process to determine whether it can serve as a vehicle for solving minor disagreements over timber harvest plans.
- o Propose a special rule to alleviate the time constraint placed upon the County for submission of non-concurrences. Seek state legislation, if necessary, to achieve this objective.

Appeals

The ability of individuals and agencies to appeal a decision made by a public agency is an important guarantee that decision-makers will consider specific local concerns prior to issuing a final determination. The Forest Practice Act does provide for appeals to the decisions made by CDF, but the process which it established is extremely one-sided.

The only party with a guaranteed right of appeal is the plan submitter. If the person proposing the timber harvest operation disagrees with CDF's decision on the plan or with certain operational conditions placed on it, he or she may appeal such action to the Board of Forestry for their consideration. Members of the public who may be affected by a timber harvest have no right of appeal whatsoever. Until the passage of Assembly Bill 3838 individual counties did not have access to an appeals procedure. The legislation, analyzed in the following discussion, did little to substantially change the inequitable appeals process, however, due to strong lobbying efforts by the forest industry.

Assembly Bill 3838

Public concern about the timber harvest review process led the legislature to adopt Assembly Bill 3838 in August of 1984.

The legislation amended the Forest Practice Act by adding 10 days to the time allotted for timber harvest review, authorizing counties to request sureties for protection of private roads used during timber operations, and allowing for counties to appeal CDF approval of timber harvest proposals to the Board of Forestry. A determination regarding how to allocate the additional 10 days for review of timber harvest proposals was not made by the legislature, but was left to the discretion of the Board of Forestry and CDF.

The County of Santa Cruz was extremely interested in this piece of legislation and was actively involved in attempts to ensure that the original goal of the bill - to resolve local concerns that arose from the transition of local timber harvest control to the state - was attained. The County was partially successful in this regard, but the bill did not alleviate certain concerns which are discussed below.

Under AB 3838, counties may request sureties for the protection of public and private roads used during timber harvest operations. Previously only requests for bonding of public roads could be considered. The bill provided that the Board of Forestry may delegate administration of sureties to the counties. Santa Cruz County opposed this provision because it did not allow for reimbursement to the county for administration costs. In addition, the bill did not provide authority for the County to conduct independent site visits to ascertain whether release of the surety would be warranted.

AB 3838 amended the Forest Practice Act to allow the Board of Supervisors of counties possessing special Forest Practice Rules to appeal a CDF decision on a timber harvest plan to the Board of Forestry. The county supported inclusion of such a provision in AB 3838 but opposed stipulations contained in

the bill which must be met to retain eligibility for appealing timber harvest approvals. According to the bill the county must participate in the preharvest inspection, review team meeting, and public hearing in order to retain appeal rights on any given harvest proposal. This requirement was opposed because it would result in the expenditure of further unreimbursed county staff time. The County offered further opposition to language in the bill empowering the Board of Forestry Chairperson to determine that a county appeal of a timber harvest proposal is unwarranted, thereby preventing a review by the entire Board of Forestry. The County's position was that the County appeal procedure should be identical to that for plan submitters, which requires full Board review.

The legislation authorized the Board of Forestry to specify special findings that must be made by the Board of Supervisors in filing an appeal, again, a stipulation that does not limit an applicant's right of appeal.

Finally, AB 3838 did not authorize other agencies involved in resource protection nor other interested persons to appeal decisions on timber harvest plans.

Policy Recommendations:

- o **Propose forest practice regulations which would utilize the 10 additional days for timber harvest review provided by AB 3838 to facilitate more in depth agency/public involvement. Seek additional state legislation, if necessary, to achieve this objective.**
- o **Attempt to secure an appeals process which guarantees the County and other involved agencies the same rights currently afforded the timber harvest plan submitter.**

DEVELOPMENT ACTIVITIES

In previous sections of this Chapter issues and impacts related to timber harvesting activities have been discussed. This section will address concerns dealing with management of timberlands from a land use perspective. Particular attention will be paid to protection of timberland for future harvesting activities to assure that today's land use decisions do not irrevocably undermine the future productivity or harvest potential of County forest lands.

Various types of timberland owners were characterized in-depth in Chapter V - Timber Management in Santa Cruz County. That discussion described the range of methods of timberland management which could occur as a result of landowner

desires or attitudes. It clearly showed that, depending on the landowner, the full spectrum of intense to virtual non-management could be occurring on similar adjacent timbered parcels.

Chapter IV - Existing Regulatory Framework - described State and County enabling legislation and actions which have been taken to protect timberlands for future production. Similar to other legislative actions which have been taken to protect the State's valuable agricultural lands, the Timber Production Zoning (TPZ) legislation provides for protection of timberlands for timber production. TPZ regulations, however, go much further by regulating the types of uses which can occur on the property and making the restrictions mandatory rather than elective.

What follows is an analysis of the County system for protecting timberlands (both TPZ and non-TPZ) and, where appropriate, recommendations for changes to that system to provide for guaranteed long-term production of timberlands throughout the County.

Timber Production Zoning

After the timberland preserve zoning process in 1978, many landowners alleged that their properties were erroneously designated as TPZ, or at least that the designation should have only included part of their property. In response to that concern, the Board of Supervisors, in December of 1980, authorized the Planning Director to prepare a study of TPZ parcels which were not commercially viable timber production units. That study indicated that approximately 2,500 acres designated as TPZ were not presently growing commercial timber. These acreages break down into the following categories:

agricultural lands	-	700 acres
chaparral lands	-	500 acres
grasslands	-	1,300 acres

In the case of currently viable agricultural operations, conversion to a timber production use is not recommended unless agricultural uses become infeasible.

Some chaparral and grasslands, however, while not presently stocked with timber, are in the process of succeeding to a mixed forest. This natural transition has often been arrested due to past land use practices. An example of this is land which has been grazed for a number of years and thus is maintained as grassland until pasturing is curtailed, whereupon it is likely to succeed quickly to brushland and eventually forest.

In some cases, site conditions may preclude the establishment of conifer stands. Such constraints may consist of shallow soils, infertile soils or rock outcrops. These lands would not meet the State definition of timberland and may thus qualify for rezoning from TPZ.

During the TPZ study it was found that there were a large number of parcels which met the State definition of timberland and the County's TPZ criteria but had not been zoned TP. Approximately 10,000 acres were found to be in this category. This apparent mis-zoning may partially explain the finding in Table 10 below that greater than 50% of the harvesting permits in the County come from non-TPZ lands. A majority of the volume removed, however, comes from TPZ.

Table 10

Timber Harvest Permit Issuance - TPZ vs. Non-TPZ (1/79-6/82)

	Number of Permits (% of Total)	Volume - mbf (% of Total)	Acres (% of Total)
TPZ	46 (46%)	32,910 (71%)	4,058 (74%)
Non-TPZ	54 (54%)	13,210 (29%)	1,411 (26%)

Currently there are few incentives to encourage qualified non-TPZ landowners to rezone into TPZ. In the past, landowners' incentives included decreased property taxes. Proposition 13, however, has provided a decrease in property taxes, which no longer make TP zoning as attractive. In addition to property tax legislation, the rezoning process is said to be costly due to the requirement for a timber management plan and other associated costs.

Land Division in TPZ

The Forest Taxation Reform Act allows for maximum densities of 160 acres/dwelling unit on a parcel of TPZ land unless a timber management plan is prepared, approved and recorded as a deed restriction on all newly created parcels. If the TPZ property owner follows these requirements, no further maximum densities are specified by the State.

The County Ordinance presently allows a 160 acre maximum density with no timber management plan and 40 acre maximum density if the above State requirements are met. Through a clustered development, a lot split may be approved which can increase the density to as high as ten acres per unit. In practice, other environmental constraints often limit development density to something below what the TPZ Ordinance itself would allow.

The Local Coastal Plan (LCP) imposes more stringent development policies for Coastal Zone TPZ lands than exist for the rest of the County. (See Figure 10) The LCP policy specifies that within the Coastal Zone no land division shall create parcels smaller than 160 acres except pursuant to a clustered development where the maximum density would be 40 acres per dwelling unit. Such clustering is advantageous to the property and surrounding landowners when timber harvests are proposed on the property because: harvests on large parcels result in fewer conflicts with neighbors; there is one congruent harvest plan and associated road system; larger parcels are more economically feasible to harvest due to the scale of operations; and because it would be more environmentally sound to have one operation use one road system instead of four operations possibly developing four different road systems. In addition, this concept reflects the County's policy to encourage production of forest products in compliance with strict environmental policies.

As density of dwellings increases, the income accruing to the owner decreases and the likelihood that timber harvesting will impinge upon his or her lifestyle increases. When this happens, the incentives to manage and harvest timber decrease (see Figure 11).

Clustered developments, while not creating TPZ parcels smaller than 40 acres (see Figure 11), do produce many of the same small parcel problems by increasing density to an allowed maximum of 10 acres per dwelling unit. The number of owners to which the income from timber management and harvesting accrues becomes so large that each owner's small portion may be insufficient, in many instances, to overcome the inconvenience and hostility he or she may feel toward the activity. In addition, when a small property is owned by several owners, a similar situation is set up as occurs among potentially uncooperative neighboring parcels. It may be very difficult to obtain a consensus about management goals, whether or not to harvest, etc. A clustered development on a TPZ parcel can produce the same problems occurring with small parcels without actually splitting the parcel below 40 acres. Unfortunately, timber management plans enforced by a contract between a group of feuding, unwilling landowners and the County seem unlikely to achieve accord, and unlikely to assure continued timber management.

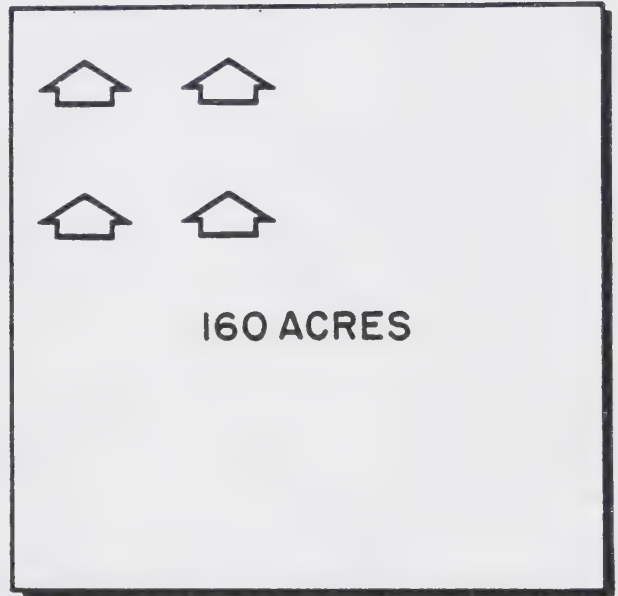
FIGURE 10

TPZ HIGHEST DENSITIES ALLOWED BY STATE AND COUNTY REGULATIONS



160 ACRES

State, County and Local Coastal:
highest density allowed with no
Timber Management Plan.



160 ACRES

Within Coastal Zone: highest
density allowed with a Timber
Management Plan, and clustering.



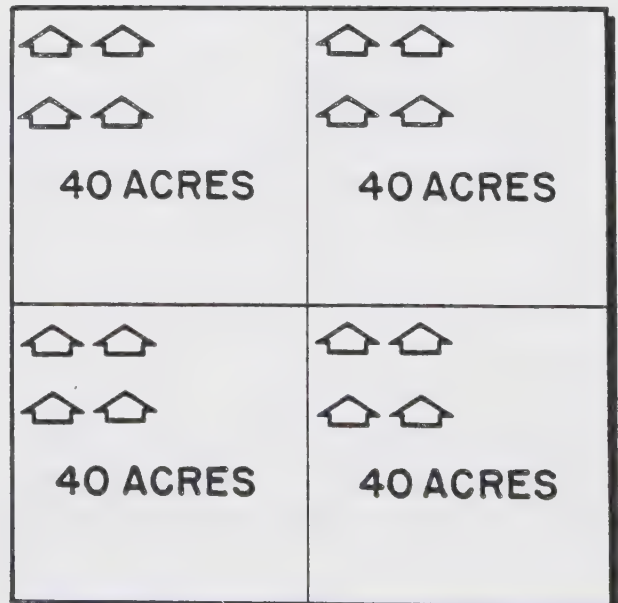
40 ACRES

40 ACRES

40 ACRES

40 ACRES

County: highest density allowed
with a Timber Management Plan
(outside Coastal Zone).



40 ACRES

40 ACRES

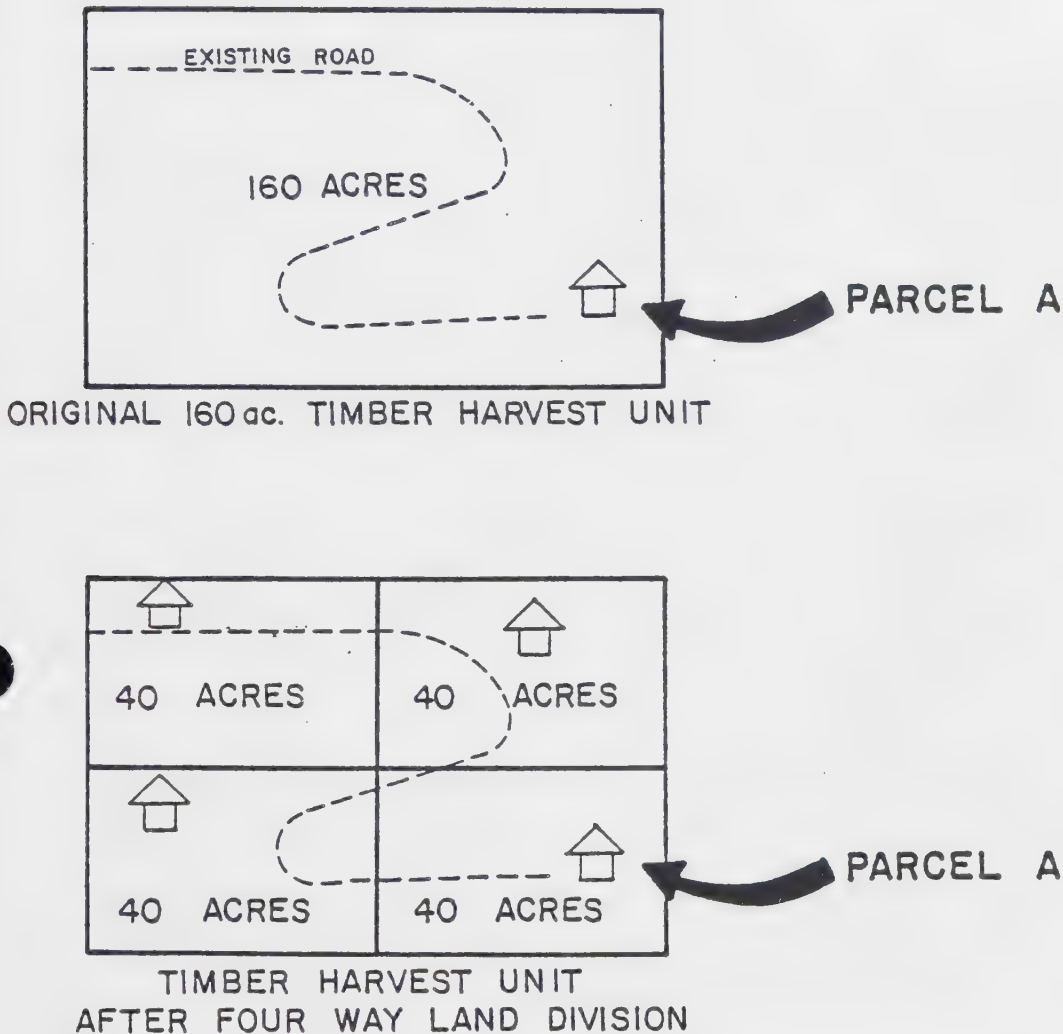
40 ACRES

40 ACRES

County: highest density allowed
with a Timber Management Plan,
and clustering.

FIGURE 11

LAND DIVISIONS AND TIMBER HARVEST CONFLICTS



OWNER OF PARCEL "A" WISHES TO HARVEST TIMBER AFTER SPLITTING ORIGINAL 160 ACRE PARCEL FOUR WAYS.

NOW THE EFFECTS OF LOGGING, SUCH AS ROAD COSTS & MAINTENANCE, NOISE, ESTHETICS AND OFF SITE IMPACTS BECOME "NEIGHBORHOOD" ISSUES DUE TO INCREASED RESIDENTIAL USE. AS SUCH, THESE FACTORS MAY BECOME PROHIBITIVE TO LOGGING OF THE PARCEL.

Clearly, a clustered development of one unit per 10 acres could create significant enough neighborhood discord and a small enough financial return for each property owner involved that, no matter what the timber management plan for the property states, harvesting would not occur.

In addition, it is important to note that the Forest Taxation Reform Act envisioned a trade-off for TPZ lands of lower property taxes in exchange for land use restrictions which maintained lands in viable timber units. The current County policy of allowing densities up to 10 acres per unit on TPZ lands results in land use criteria, other than TPZ designation, becoming the factors which control density on TPZ lands. Since nearly all TPZ properties, by their location, are designated Mountain Residential (10-40 acres/unit) in the General Plan, and the Rural Density Matrix determines where within the density range a particular parcel can divide to, the fact that the parcel is zoned TP becomes unimportant. Such policies are clearly not what was envisioned by the Forest Taxation Reform Act.

A study was conducted in May 1984 to better understand the TPZ density issue. That study, conducted of currently-zoned TP parcels, noted parcel size, existing development level, and potential for new development. From this information various scenarios for future development densities could be evaluated to determine potential new units which could be constructed on TPZ lands. This information is presented in Table 11.

Table 11 presents a number of different land use scenarios, including existing policies, and develops a range for potential new units which could be constructed on TPZ parcels in response to the policies. For example, under "existing policies" a range is given from totally clustered development (1,748% increase in units) to totally non-clustered development (477% increase in units). What will actually occur is something between these two figures, but what could occur is much closer to the former number.

Likewise, the various scenarios distinguish between densities in the Coastal Zone and outside of the Coastal Zone (non-Coastal Zone). In some cases a scenario assumes that a distinction will continue to exist regarding land use densities between these areas, (e.g. 40/160) while in other cases it is assumed that the densities will be similar throughout the County (e.g. 40/40).

It should be noted that these numbers are subject to modification by other policies of the General Plan (e.g. Rural Development Matrix), but it is clear that a significant number of new units could be constructed in timbered areas of the County under a number of these scenarios.

As new units are constructed in these areas the likelihood of conflicts between residents and timber harvesting will continue to rise. As noted previously, such division of TPZ parcels will also continue to undermine the economic viability of these important timber units. A reevaluation must therefore be made of current density standards on TPZ lands to assure long-term viability of the County's most productive lands.

In earlier discussions it was noted that LCP policies for the County's Coastal Zone areas require a maximum density of 160 acres/unit on TPZ parcels, while allowing densities, where clustered and accompanied by a timber management plan, of 40 acres/unit. Such standards allow closer consistency with the intent of the Forest Taxation Reform Act, while still allowing for some development on these lands.

Proposed scenario #2, from Table 11, evaluates the increase in units which could be allowed if the LCP standards were applied Countywide. A total of up to 930 new units could be constructed on TPZ lands under this scenario. While this number may seem high (it is over 6 times the current number of units presently located on such lands and could allow for an overall density on TPZ lands Countywide of slightly less than 40 acres/unit) many parcels, due to owner intent or other land use restrictions, will remain at far lower densities.

Proposed scenarios #1 and #3 would result in a similar number of ultimate units within TPZ lands, but would continue the existing distinction between Coastal Zone and non-Coastal Zone policies. There appears to be no basis, from a timberland management perspective, to continue that distinction.

Proposed scenario #4 would allow for a consistent Countywide standard and would give no density credits for clustered developments. This scenario takes a strict interpretation of the Forest Taxation Reform Act policies - applying the 160 acre/unit guideline to all cases. It is by far the most protective of timberlands, allowing total buildout units to only equal less than three times the present number of units on TPZ parcels and an average parcel size of 90 acres/unit. Such a policy would be ideal from a timber management perspective.

In conclusion, existing policies governing TPZ densities will not adequately protect timberlands for future timber production. The existence of a two tiered system of density policy for coastal zone and non-coastal zone parcels has no technical basis. An overall minimum parcel size of 160-acres/unit would be the most protective policy which could be considered.

**Table 11: Evaluation of Buildout on TPZ Parcels
Under Various Land Use Policy Assumptions**

Scenario	Non-Coastal Zone Coastal Zone (Acres per unit)	Existing Units	Potential New Units From Existing Parcels	Potential Units From New Lots	Units at Buildout	Percent Increase Existing Buildout
<u>Existing Policies</u>						
clustered	10 acres/40 acres	233	359	3,482*	4,073	1,748%
non-clustered	40 acres/160 acres	233	359	519	1,111	477%
<u>Proposed Scenario #1</u>						
clustered	40 acres/40 acres	233	359	930	1,522	653%
non-clustered	80 acres/160 acres	233	359	139	731	313%
<u>Proposed Scenario #2</u>						
clustered	40 acres/40 acres	233	359	930	1,522	653%
non-clustered	160 acres/160 acres	233	359	44	636	272%
<u>Proposed Scenario #3</u>						
clustered and non-clustered	40 acres/160 acres	233	359	519	1,111	477%
<u>Proposed Scenario #4</u>						
clustered and non-clustered	160 acres/160 acres	233	359	44	636	272%

*such extensive development would not likely be allowed by current Planning policies.

Clearly, there is some merit for allowing densities greater than 1 unit/160 acres on TPZ lands where units can be clustered in such a fashion to not impact the timber resource. The policy must also assure that such standards do not allow for too many landowners to share a small piece of timberland - thereby removing the economic incentive to harvest. As well, from a policy and technical perspective, a consistent set of density criteria Countywide would be most appropriate. Alternative scenario #2 is, therefore, suggested as an alternative to the current policy governing densities in TPZ areas.

Timberlands Not Zoned TPZ

Large acreages of timberland exist throughout Santa Cruz County which have not been designated as TPZ lands. An evaluation of the location of historic timber harvests relative to zoning has indicated that greater than 50% of timber harvests have occurred on non-TPZ lands (see Table 10). Earlier in this section it was noted that over 10,000 acres of land meet TPZ criteria but were not so-zoned during the rezoning which took place in 1978. A large amount of this acreage has been designated in the County's General Plan as "Timber Resource", but not zoned TPZ.

The County General Plan states, relative to these lands:

"2.4.2. Restrict the division of large (over 20 acres) land ownerships in areas designated as Timber Resources on the General Plan Resources and Constraints Maps to preserve economic timber units."

The intent of this policy was to recognize that there is value in protecting non-TPZ land in economic units for future timber production. The acreage restriction does not, however, allow for adequate protection, particularly if the property could eventually be rezoned to TPZ (see preceding discussion).

In the context of the findings of this report such a policy could instead be used on an interim basis until TPZ zoning could be carefully evaluated and current inaccuracies corrected. Once the rezoning process was completed, there would no longer be a need for the acreage limitation, but until that time a limitation of at least 40 acres would be more consistent with a possible future TPZ designation.

Timber Harvesting Circumventing Land Use Regulation

For some time there has been concern regarding the possibility that timber harvests could become the means for preparing a property for other land use activities (primarily residential) and circumventing the normal County review

process. While the County maintained permit authority over timber harvest activities, the chance of that occurring was minimal.

Since the County lost permit authority through the passage of SB 856 this concern has once again surfaced. The potential for such abuses of the system are clearly understood by some members of the industry. In a letter to a potential investor, a local land development company, in describing their method of land purchase - logging and then resale of the property - indicated, "Once the logging is completed, the land will be in a semi-developed state, complete with roadways and building permit; while having completely circumvented the need for environmental impact reports and other costly permits".

Clearly, most industry representatives would be alarmed at this suggestion. However, clearly it is possible, and in fact is the intent, for some parties to take advantage of the potential to build roads and landings to CDF standards and then use these substandard improvements for driveways, roads, and building sites.

The concern regarding potential abuses of CDF's system has brought together our local assemblyman, industry representatives, and local citizens in an attempt to eliminate such possible abuses.

One suggestion under consideration is for reopening the TPZ rezoning process, thereby allowing parcels which were inappropriately zoned relative to TPZ to be correctly zoned. Another option, and one which more directly addresses the possible system abuses discussed above, would be to create a two-tiered system for timber harvest operations. The existing rules, with slight modifications, would apply to TPZ parcels, while a more stringent set of rules (similar to County grading permit review) would be required of all road or landing construction on non-TPZ lands. This later option would serve the purpose of both assuring road and landing construction consistent with long-term land uses and as an inducement for rezoning to TPZ where a landowner's long-term land use intent is for timber management and harvesting.

Policy Recommendations:

In order to achieve the County's goal "to protect and maintain the timberland of the County through regulation of the timberland use..." (County Code 13.10.371), a number of local policy and state policy changes are required. The following changes are intended to address the issues raised in this section.

- o State authority should be sought to allow for a reevaluation and zoning of TP parcels throughout the County. In the interim, all parcels designated "Timber Resource" in the General Plan, but not currently zoned TPZ, should be reviewed for potential TP Zoning and, where such zoning would be appropriate, should be subject to the same restrictions as TPZ land.
- o The policy governing land divisions on TPZ lands should be changed to allow for a minimum parcel size of 160 acres where clustering does not take place, and 40 acres where clustering takes place. This policy would apply Countywide and would allow for greater consistency with the intent of the Forest Taxation Reform Act.
- o State regulations should be sought to require more stringent regulation of road and landing construction (equivalent to County Grading Ordinance requirements) for timber harvests on non-TPZ lands. State legislation to achieve this objective should be sought if necessary.

CHAPTER VII

CONCLUSION/RECOMMENDATION

Conclusion

The perception that timber management planning makes economic sense both for individual timberland owners and for the County at large cannot be disputed.

The Timber Management Element of the County General Plan and timber management plans prepared for individual ownerships, are founded on the idea that a mix of forest uses will be more lucrative than a single use. Certain uses are readily measured in dollars and cents: acre feet of water, pounds of steelhead and salmon, board feet of timber, BTUs of fuelwood. Other uses are not bought and sold but are of obvious high value: open space, aesthetic beauty, nongame wildlife, genepool conservation. A mix of uses which maximizes the summed net benefit from all uses over the long run is a guiding principle of all valid timber management.

A part of maximizing net benefit is conserving the productive potential of the forest and enhancing it where possible. In Santa Cruz County this can be done by influencing the structure and composition of the terrestrial and aquatic ecosystems. Two key goals are to increase the quality of water and quantity of wood. Opportunities to do so are at hand and the Timber Management Element attempts to provide recommendations to a number of key decision makers - landowners, government officials, and foresters - for increasing production of these and other commodities and amenities in a context of balanced use.

The Timber Management Element identifies opportunities to substantially increase the production of valuable softwood from timberlands. Benefits from increased production would accrue to a variety of individuals and institutions. In addition to the cash value and multiplier effect of stumpage receipts, it can only be a positive trend for an increasing component of the County's economy to be based on a stable, renewable resource.

Increased timber production and revenue generation are of value for solidifying the concept of protecting timberland for long-term management. It is important to institutionalize timber production and compatible low density uses in order to assure that the long-term productive potential is maintained. This plan makes recommendations to commit these lands for timber production as the highest and best use.

Growing timber is a good neighbor. In an already urbanized County, timber harvesting needs to be an equally good neighbor. Lifestyles in urban and rural areas of the County are enhanced by proximity to growing stands of timber which provide open space, aesthetics amenities, quality watershed and wildlife habitat. When loggers arrive every twenty years or so to harvest the timber crop, a potential arises for a short term loss of amenity, inconvenience, safety concerns on private and County roads, and a potential for impacts to water quality. Recognition of these potential impacts has led to government regulation. The Timber Management Element discusses the level of impacts to non-timber forest uses and makes recommendations to assure that balance among uses is maintained as timber production is increased.

As timber production increases, public awareness of the economic and environmental significance of timber harvesting becomes more important. To participate effectively in decisions relating to timberland production, timber management and timber harvesting, the public must be well informed about logging, forestry and ecosystem science. Chainsaws and log trucks will seem less frightening when the context in which they are being operated is better understood.

Neighborliness is reciprocal. Timberland owners need to know their neighbors and share expertise and ideas. The County Timber Management Element provides information which can make harvests more palatable in the neighborhood. Opposition to timber harvesting may not develop if people know what is going on and are aware of who is involved.

Therefore, this document serves many purposes. As a policy document it helps to guide decision makers to the most prudent policy course. For foresters it serves as an informational/technical document to provide important data on current and future trends for timber growing and harvesting in the County. For the timberland owner it provides a framework within which important long range plans can be formulated. And for the public, it serves to balance the various views regarding timber management and timber harvesting and provide valuable information.

Implementation of the Element by non-policy makers, such as landowners and foresters, will be informal but is of utmost significance if its goals are to be achieved.

Specifically, for decision makers in County government, proposals for changes to the County General Plan Timber Policies have been amended and developed and are presented below. These recommendations constitute a major component of the Timberland Management Element's implementation phase.

Recommendations

The following section is presented as the policy framework within which decisions regarding timber management and harvesting should take place. It is envisioned that this section would become part of the County General Plan, replacing the existing section 2.4 - Timber. Where appropriate, these general policy statements would be translated into specific changes to the Timber Production Zone Ordinance and overall guiding general plan policies, and would become a framework for proposing changes to the Board of Forestry's regulations governing timber harvest operations.

2.4 TIMBER

OBJECTIVE

- 2.4.1 To encourage the orderly economic production of forest products on a sustained yield basis under high environmental standards, to protect the scenic and ecological values of forested areas, and to allow orderly timber production consistent with the least possible environmental impacts.

POLICIES

- 2.4.2 Prohibit development densities on land zoned Timberland Production located in the Coastal Zone exceeding one unit per 160 acres and in other areas of the County exceeding one unit per 40 acres, except as specified below and require that the following conditions be met in connection with any permitted development:

a) A Timber Management Plan, prepared by a Registered Professional Forester, must be submitted and approved by the County for the entire land holding.

b) Division of land below 160 acres may be considered only if parcels are designed to maintain timber harvest and management potential of the property, and if all development is clustered. In any case, such division shall require approval of four-fifths vote of the Board of Supervisors.

c) In no case may the average density exceed one unit per 40 acres in the Coastal Zone and one unit per 10 acres elsewhere.

d) The remainder of the property not included within the area of clustered parcels shall be held in common ownership, and timber rights shall be held by a designated property owner or individual.

e) The individual designated as possessor of timber rights on the property shall enter into a binding contract with the Board of Supervisors to manage and harvest timber on the timberland and to abide by the provisions of the Timber Management Plan.

2.4.3 Allow the following types of activities as compatible uses in Timberland Preserve Zones:

Permitted Uses

a) The growing and harvesting of timber and other forest products, including Christmas trees, in conformance with the provisions of the Timberland Production Ordinance and the Forest Practice Act.

b) Watershed management.

c) Fish and wildlife habitat.

d) Grazing and other agricultural uses on that portion of the land not under timber production.

e) One single-family dwelling, with accessory structures and utilities, on a separate legal parcel of record, subject to the policies of section 2.4.

Conditional Uses

a) Mineral production and mining operations, in conformance with the provisions of the Mining Regulations Ordinance.

b) Erection, construction, alteration and maintenance of gas, electric, water or communications transmission facilities.

c) Outdoor recreation, educational or religious activities, in conformance with the provisions of the County's organized camp zoning regulations which do not conflict with the management of the parcel's timber resources.

d) Conversion to agricultural uses not exceeding ten percent of the total of the timber area on the parcel.

e) One guest house on a legal parcel of record with a minimum size of 40 acres in the Coastal Zone and 10 acres in other areas of the County where the guest houses will be located in close proximity to the principle residence.

f) Division of property, consistent with policies 2.4.2 and 2.4.3.

g) Timber processing and other related facilities.

Conditional uses must be consistent with the growing of a sustained yield tree crop, with the purposes of the Forest Taxation Reform Act of 1976 and the TPZ Ordinance, and should be supported by a timber management plan.

- 2.4.4 Evaluate proposed land divisions on properties designated Timber Resource on the General Plan Resources and Constraints Maps, but not zoned TPZ, for timber resource potential. Apply the policy of 2.4.2 for any parcel found to have timber resources equivalent to TPZ parcels. Require as a condition of any land division rezoning to TPZ for parcels which have equivalent timber resources.
- 2.4.5 Restrict development on TP Zoned lands to be located on a non-timbered portion of the property.
- 2.4.6 Encourage timberland owners to apply for Timberland Production Zoning where appropriate. Such rezonings must be in accordance with the procedures set forth in the TPZ Ordinance.
- 2.4.7 Deny rezoning of timberland from TPZ to alternate zone districts unless it can be shown that the rezoning is consistent with the Forest Taxation reform Act of 1976 and the County TPZ Ordinance.
- 2.4.8 Require all timber harvests not subject to California State Department of Forestry regulation to receive a Timber Harvest permit from the County prior to beginning operations. All such harvests within the Coastal Zone must also receive a Coastal Zone Permit.
- 2.4.9 Require strict review of all timber harvests subject to County regulation to assure minimal environmental and neighborhood impacts. Deny all applications which cannot meet those standards.

PROGRAMS

2.4.101 Encourage the adoption of State legislation allowing for:

- a) Reevaluation of Santa Cruz County TPZ designations;
- b) Establishment of a two-tiered system for timber harvest review - one for TPZ lands, and a more stringent system for non-TPZ lands.

Responsibility: Board of Supervisors, Planning Department

2.4.102 Encourage the adoption of State legislative changes to the Forest Practice Act to accomplish the following:

- a) Create a consistent appeals process to the Board of Forestry of the CDF Director's determinations;
- b) Extend the purpose and intent of the Act to include the protection of public health, safety and welfare;
- c) Expand the role of the Interdisciplinary Review Team to allow changes to timber harvest plans.

Responsibility: Board of Supervisors, Planning Department

2.4.103 Recommend Special Santa Cruz County Timber Harvest Rules for adoption by the State Board of Forestry which make the following changes to the process for reviewing timber harvest plans:

- a) Expand plan contents to add more information on the plan for public and agency review;
- b) Establish better defined procedures for the request, conduct, and follow-through related to public hearings;
- c) Require written response from CDF to public issues raised;
- d) Require full noticing for major plan amendments;
- e) Require transmission of the Notice of Conformance to members of the Board of Supervisors;
- f) Allow County staff to attend all field reviews conducted by CDF;

g) Require the submission of relevant materials prior to review team meetings.

Responsibility: Board of Supervisors, Planning Department

2.4.104 Recommend Special Santa Cruz County Timber Harvest Rules for adoption by the State Board of Forestry which make the following changes to the Forest Practice Rules:

a) Provide CDF with the authority to deny a timber harvest plan based upon its potential for cumulative impacts;

b) Encourage shared road access between adjacent timber owners;

c) Allow for selecting the haul route which minimizes neighborhood impacts;

d) Allow for bonding on private roads used for log hauling;

e) Provide CDF with the authority to restrict or prohibit winter operations in certain situations;

f) Restrict road and landing construction in steep areas and, where allowed, establish special design and construction standards.

Responsibility: Board of Supervisors, Planning Department

2.4.105 Conduct a Timber Harvest Water Quality Monitoring Study to assess the effectiveness of certain Forest Practice Rules and present findings to the State Water Resources Control Board. If study findings indicate that the rules do not provide adequate water quality protection, make recommendations for regulatory improvement in the areas of:

a) Watercourse and Lake Protection;

b) Erosion Hazard Rating system;

c) Standards for erosion control.

Responsibility: Board of Supervisors, Planning Department

2.4.106 Evaluate the adequacy of the Forest Practice Rules in the following areas and, if necessary, recommend special rules for adoption by the Board of Forestry:

a) Protection of rare, endangered, or unique plants or animals;

b) Protection of viewsheds and scenic corridors.

Responsibility: Board of Supervisors, Planning Department

2.4.107 Insure that the County's concerns regarding individual timber harvests are addressed through active participation in review team meetings and CDF public hearings.

Responsibility: Planning Department

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